German Diesel Hydraulic

...page 24

T&P Welds Crankshafts

...page 33

RAILWAY
LOCOMOTIVES AND CARS
A SIMMONS-BOARDMAN TIME-SAVER PUBLICATION
MARCH 1960

L&N Production-Line Air Brake Overhaul ... page 19

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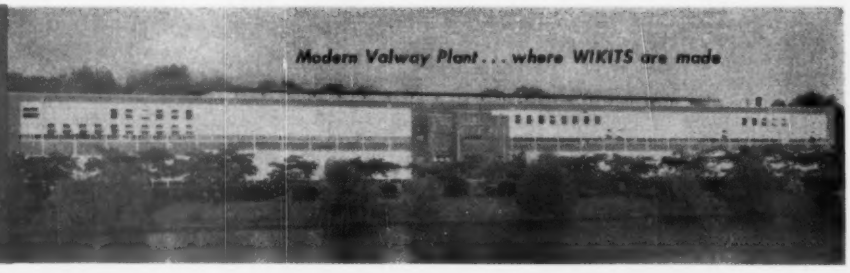

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RAILWAY
LOCOMOTIVES AND CARS

The Oldest Trade Paper In the United States

March 1960—Vol. 134, No. 3

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FOREIGN REPRESENTATIVES: Sibley-Field Publishing Company, Ltd. 8/9 Clerkenwell Green, London E. C. 1. England; Georg J. Linder, (16) Frankfurt a. Main, Wittelsbacher Allee 60, West Germany.

Railway Locomotives and Cars is a member of the Audit Bureau of Circulation (A.B.C.) and is indexed by the Engineering Index Service. Printed in U.S.A.

Published monthly by the Simmons-Boardman Publishing Corporation, 10 W. 23rd St., Bayonne, N. J., with editorial and executive offices at 30 Church St., New York 7. James G. Lyne, Chairman of the Board; Arthur J. McGinnis, President and Treasurer; Duane C. Salisbury, Exec. Vice Pres.; George Dusenbury, Vice-Pres. and Editorial and Promotional Director; M. J. Figa, Vice Pres. and Director of Production.

CIRCULATION DEPARTMENT: **R. C. Van Ness, Director of Circulation, 30 Church st., New York 7.** Re-entry of second class privileges authorized at Newark, N. J., with additional second class privileges, Bristol, Conn. Subscription price to railroad employees only in U.S. possessions and Canada, $2 one year, $3 two years, payable in advance. Subscription price to railroad employees elsewhere, $8 per year. Single copies, 75¢. Address all subscriptions and correspondence concerning them to: Subscription Department, Railway Locomotives and Cars, Emmett st., Bristol, Conn. Changes of address should reach us three weeks in advance of the next issue date. Send old address with the new, enclosing, if possible, your address label. The Post Office will not forward copies unless you provide extra postage. Duplicate copies cannot be sent.

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REPORT FOR MARCH

ASME-AIEE Railroad Conference

The American Society of Mechanical Engineers and the American Institute of Electrical Engineers will hold a Railroad Conference at the Penn-Sheraton Hotel, Pittsburgh, Pa., April 20 and 21. The technical program for this conference is as follows. Sessions will be held in the Monongahela Room.

SESSION I
Wednesday, April 20
9:30 a.m.

The Slippery Spot Concept of Adhesion —J. C. Aydelott, General Electric Co.

Study of Defects that Originate and Develop in the Treads of Railroad Wheels During Service—J. M. Wandrisco and F. J. Dewez, Jr., U. S. Steel Research Center.

Understanding Wheel-Rail Adhesion — G. M. Cabble, Jr., Westinghouse Air Brake Co.

LUNCHEON
12:30 p.m.

Speaker—J. W. Barriger, president, Pittsburgh & Lake Erie. Topic: Railway Electrification.

SESSION II
2 p.m.

The World's Most Modern Ore Unloading Facility—R. C. Tench, materials handling engineer, Chesapeake & Ohio.

French Technical Advances in the Field of Railroad Electrification—F. Nouvion, French National Railroads.

Forces Between Wheel and Rail—F. F. Olson, Swedish State Railroads.

SESSION III
Thursday, April 21
9:30 a.m.

Locomotive Repair Costs and Their Economic Meaning to the Railways of the United States—H. F. Brown, Gibbs & Hill, Inc.

Electric Locomotive Maintenance Cost Equation—J. W. Horine, electrical engineer, Pennsylvania.

Spectrographic Analysis of Diesel Lube Oil—J. C. Smith, General Electric Co.

LUNCHEON
12:30 p.m.

Speaker—Dr. S. W. Herwald, vice-president—research, Westinghouse Research Laboratories.

SESSION IV
2 p.m.

Automation in Railroading — V. E. McCoy, Chief Purchasing officer, Chicago, Milwaukee, St. Paul & Pacific.

Automated Testing of Railway Freight Brake Control Valves—P. W. Brath and E. T. Skantar, Westinghouse Air Brake Co.

Air Cleaning Features for Traction Equipment—P. G. Lessmann, Westinghouse Electric Corp.

AAR Establishes TOFC Task Force

A special task force, under supervision of the AAR Mechanical Division Arbitration Committee, is preparing an Appendix to the Interchange Rules to be applicable to railroad owned and/or leased trailers and containers used in piggyback service. With a uniform code as the goal, the appendix will define owner and handling-line responsibility for damage, schedules covering various kinds of repairs with equitable charge for each, a system of carding and protection for unfair damage, per pound prices to cover settlement for each type of trailer destroyed when away from home line, rates of depreciation for each style and type of trailer, reproduction costs and other details.

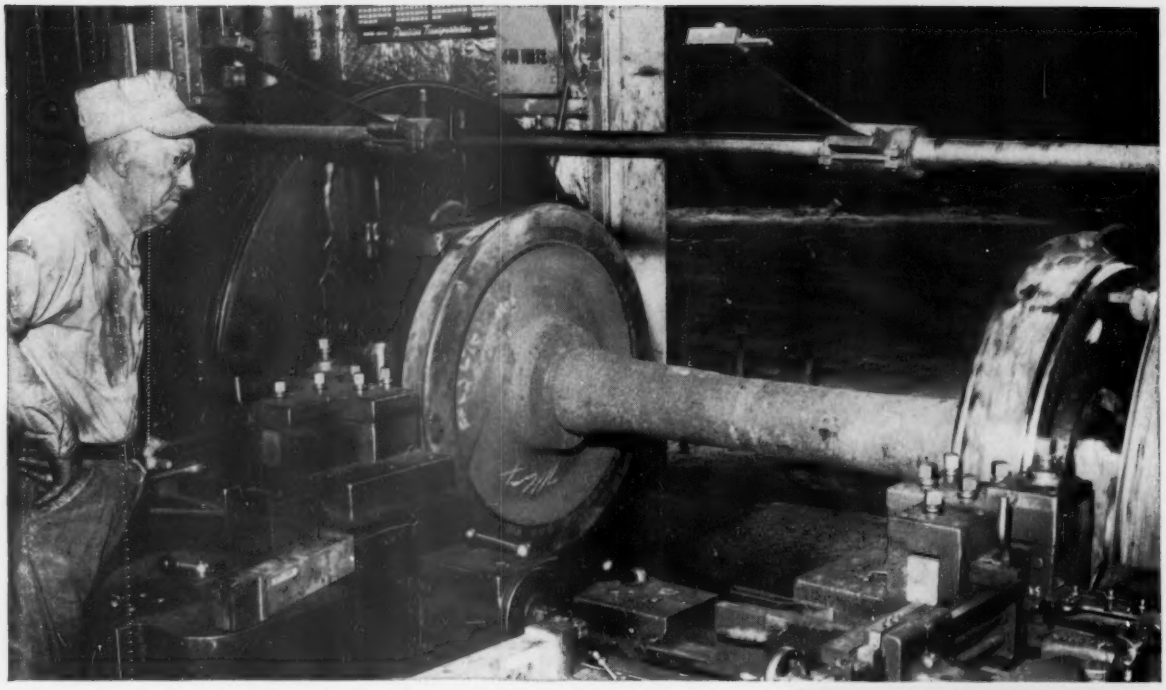
All types and designs of trailers and containers are to be checked and studied. Field studies are being made where trailers and containers are loaded, interchanged, unloaded, repaired and maintained. A committee of four, headed by J. P. Svetlecic, special representative of the Missouri Pacific, expects to complete the assignment by the end of the year.

TIME SAVING IDEAS FOR MARCH

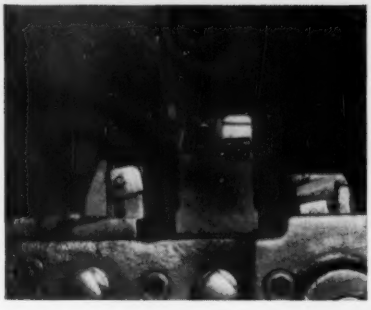
MOTIVE POWER AND CAR

ELECTRICAL

DEPARTMENTS



Photographs courtesy of Norfolk and Western Railway Company, Roanoke, Virginia



Tool-cost-per-wheel cut 77% by switching to new Kendex* tooling

All other factors in this tread contouring setup remained the same . . . same lathe, same operator, even the same grade carbide (Kennametal K21) was used for all cutting edges. The only change was to switch from Kennametal "H" type tooling with regrindable inserts to new Kendex tooling with turnover, "throw-away" type inserts. The result . . . tool-cost-per-wheel dropped 77%. The table gives the operational data in detail.

A solid Kennametal shim provides a solid seat for the insert and permits harder, more wear-resistant grades of Kennametal to be used when required. Chipbreakers of Kennametal provide better chip control and eliminate chipbreaker grinding.

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OPERATIONAL DATA: Niles car wheel lathe, turning 33", 36" and 40" diameter wheels at 14 to 16 RPM, 1/16" to 3/32" feed, and 3/8" maximum depth of cut.

	Kennametal "H" type tooling with Kennametal K21 inserts	New Kendex tooling with Kennametal K21 inserts
Insert cost	$15.13	$4.03
Insert regrinding cost	9.00 (10 regrinds)	NO regrinding*
Total insert cost	$24.13	$4.03
Wheels per cutting edge	6	6
Cutting edges per insert	11 (orig. edge + 10 regrinds)	8*
Wheels per insert	66	48
Insert cost per wheel	$24.13 ÷ 66 = .366	$4.03 ÷ 48 = .084

*Kendex tooling eliminates all regrinding. When one edge becomes dull, the insert clamp is released, the insert turned to a new edge and reclamped without disturbing the tool . . . no need to reset or gage the tool. When all eight edges of the insert have been used it is replaced.

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Control Refinements Discussed by AIEE

The user may now decide the relative importance of getting full engine performance, of simplicity, of dependability, of first cost, or of ease of maintenance and select a control system for diesel-electric locomotives best suited to his needs, according to a report made by land transportation engineers at the recent meeting of the American Institute of Electrical Engineers at New York. One control system, a transistorized arrangement, includes a highly sensitive adhesion loss detector (slip relay) which will detect differences in wheel speeds quickly enough to permit their being stopped by reduction of excitation or quick brake application (page 41 this issue). In flat country, it was stated, high-speed wheel slip is a problem.

More electrification of railways in the United States was predicted by L. C. Curtis, assistant engineer, Pennsylvania. However, this depends upon railroad prosperity, rising cost of diesel-locomotive maintenance, relative costs of liquid fuel and electric power, and the need for improved train handling performance. Discussion pointed out the fact that 1,500 hp of power supplied to an electrified system performs the same work as 6,000 diesel horsepower.

Nearly all diesel locomotives in this country have been truck-type units which have operated satisfactorily at all speeds. In French tests made in 1955, truck type electric locomotives were operated at speeds up to 205 mph. This was pointed out in a discussion of the development of the running gear of the Pennsylvania GG-1 4,620 hp electric locomotive.

Until the advent of the Union Pacific's 8,500-hp gas turbines, no American locomotive could match the short-time 9,300-hp performance of the Pennsylvania's GG1's. Their 2-C-C-2 wheel arrangement delivers high power at high speed with a minimum of damage to track. At the conclusion of 25 years of service by the first GG-1 last May, the 139 locomotives had operated a total of 337,000,000 locomotive-miles. J. W. Horine, electrical engineer, Pennsylvania, discussed the highlights of the GG-1's quarter century of service.

Another paper discussed the superior performance of the Virginian motor-generator locomotives. These locomotives were built in 1948. Attention was called to the need for including the cost of contact system maintenance in the cost of maintaining electric locomotives when making comparisons with diesel maintenance costs.

Other papers described experiences with electric operation on the Sorocobana Railway of Brazil; the high-performance rapid-transit cars on the Hudson & Manhattan (RL&C, July 1958, p 38); and the bi-level central power passenger equipment on the Chicago & North Western (RL&C, Nov. 1958, p 32, and Dec. 1959, p 22).

Digital computers for determining train operation provide a relatively easy method of evaluating proposed changes either in the right-of-way or the operating schedule without the expense and difficulty involved in actual field tests. Two papers covering this subject showed how it is now possible to calculate the performance of a train over 100 miles of railroad in 8 min.

(Turn to page 50)

Orders and Inquiries for New Equipment

Placed Since the Closing of the February Issue

Diesel-Electric Locomotive Orders

Road and builder	*No. of Units*	*Horsepower and type*	*Detail*
CENTRAL OF GEORGIA:			
Electro-Motive	8	1,800 road switchers	GP-18's. Estimated cost, $1,414,000. For delivery in June.
QUEBEC CARTIER MINING CO.:			
Montreal Locomotive Works	17	1,800 road switchers	Quebec Cartier, Canada's newest railroad, has received the first unit in this order. Units to operate in four-unit combinations to move 125-car trains 193 mi. from an iron concentrating plant in northern Quebec to Port Cartier, Que. Completion of road slated for late this year.

Freight-Car Orders

Road and builder	*No. of cars*	*Type of car*	*Detail*
AMERICAN REFRIGERATOR TRANSIT:			
Pullman-Standard	100	Refrigerator	50½-ft RBL's. Approx. cost, $17,000 each. For May delivery.
GREAT NORTHERN:			
American Car & Fdry.	250	Box	50-ft, plug-door type, equipped with roller bearings. For second and third quarter delivery.
	10	Flat	85-ft. For second and third quarter delivery.
International Car	10	Caboose	For second and third quarter delivery.
Ortner Car	25	Gondolas	Mill type. For second and third quarter delivery.
Pacific Car & Fdry.	200	Box	Insulated, for subsidiary Western Fruit Express. For second and third quarter delivery. These 200 cars reported in February issue as having been ordered from company shops.
Pullman-Standard	100	Open-top hopper	For second and third quarter delivery.
	75	Covered hopper	Delivered in February.
ILLINOIS CENTRAL:			
Bethlehem Steel	200	Gondola	70-ton.
ROCK ISLAND:			
Pullman-Standard	100	Box	50½-ft, 50-ton PS-1's. To have 15-ft. doors and DF loaders.
	100	Piggyback flat	85-ft. In addition to 100 flats ordered last November.
SANTA FE:			
	500	Mech. reefers	50-ft, 70-ton. Cost, almost $15,000,000.
SAVANNAH & ATLANTA:			
Ortner Co.	8	Bulkhead flat	53-ft 6-in., 50-ton. To have cast-steel underframes and interlocking upright end posts supplied by General Steel Castings Corp.
SEABOARD AIR LINE:			
American Car & Fdry.	500	Open-top hopper	70-ton. Total of 800 cars listed here to have roller bearings.
Magor	100	Hopper	90-ton, of low-alloy high-tensile steel.
Pullman-Standard	200	Covered hopper	70-ton.
SOO LINE:			
Pullman-Standard	10	Piggyback flat	85-ft. For delivery in May.
SOUTHERN PACIFIC:			
General American	100	Piggyback flat	R-85, 85 ft.
WABASH:			
American Car & Fdry.	550	Box	50-ton, 40-ft 6-in., to be equipped with roller bearings and have 8-ft door openings. General Steel Castings to supply cast-steel underframe ends and bolsters for 200 of these cars. Cost, over $5,000,000. For June-July delivery.
Company shops	350	Box	50-ton, 50-ft 6-in., with 15-ft double doors. Order includes 150 roller-bearing cars, of which 100 will have adjustable belt rails and door posts and 50, fixed rails and adjustable door posts.

Notes and Inquiries

Central of Georgia inquiring for 60 3,500-cu ft capacity roller-bearing covered hopper cars, estimated to cost $760,000, and 40 2,010-cu ft roller-bearing covered hopper cars, estimated to cost $420,000. Expected delivery date: May or June.

Chicago & North Western. Air Brake Division, Westinghouse Air Brake Co., will supply No. 26 brake equipment and tread brake units with Cobra shoes for 116 bi-level commuter cars, order for which is reported in February issue, p 7. Order also includes locomotive brake equipment for 42 of the cars to permit push-pull operation.

New York Central plans to acquire 1,600 hopper cars, 300 box cars, 200 regular flat cars, and 100 Flexi-Van cars.

New York City Transit Authority, between 1961-1964, will need 1,800 new subway cars to replace obsolete equipment. Authority currently exploring possibility of ordering all cars at one time, with deliveries spaced out over a specified period.

Seaboard Air Line will convert 200 coal hopper cars into wood-chip cars at its Portsmouth, Va., shops at a cost of approximately $1,000,000. Parts for new bodies for the cars are being manufactured by Pullman-Standard.

Wabash to do major repair and upgrading on 1,600 freight cars of various types.

These five pennies, during a 12-year period, more than covered all parts replacement costs on an average

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Ever since the introduction of the first C-1 truck over 12 years ago the basic design has remained unchanged. Today's National C-1 Trucks are still the original design—*a design that was right to start with.*

Here's proof of the correctness of that design.

In spite of the fact that many of these trucks have covered hundreds of thousands of miles, our service parts sales records show an average replacement rate of an extremely low .00129% for wedges, wedge springs and wear plates.

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A-396A

wedges
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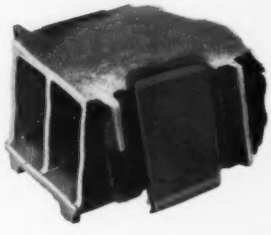
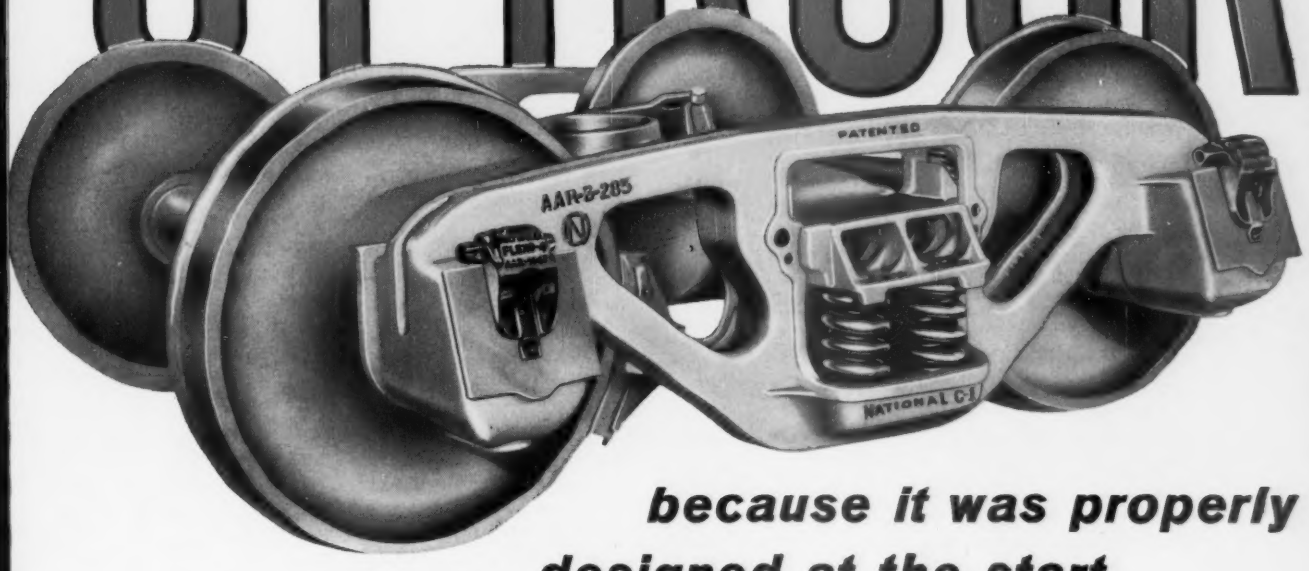
wedge springs
.0019% replacement



wear plates
.00064% replacement

See the National C-1 Truck with over 370,000 miles "reefer" service in 8 years.
On display at the ARSA Show Hotel Sherman, Chicago, September 20-23.

C-1 TRUCK



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EDITORIALS

Where To from Here?

The primary advantage of rail transport is due to the fact that the forces retarding the steel wheel rolling on the steel track are only about one sixth those of the rubber tire on concrete. Steel-to-steel adhesion is not as good as that of rubber to concrete and, to provide for this as well as to keep things simple, driving wheels of steam locomotives were coupled.

It was logical, when electric locomotives came along, to copy the wheel arrangements of steam locomotives which had proved best in practice. The Ten-Wheeler 4-6-0 was one of the good ones and, when the Pennsylvania's GG1 electric was built, it incorporated the wheel arrangement of two Ten-Wheelers back to back. This allowed for the large power output and provided good riding and tracking characteristics.

When the diesel-electric locomotive came along in 1924, it was made by putting the power plant and electric transmission on a baggage car with motors geared to the wheels on swivel trucks. The primary purpose of the installation was to prove that the diesel engine could be satisfactory railroad motive power.

From this beginning, more truck type diesel locomotives were built for increasing horsepowers and for higher speeds. They progressed from switching to passenger and finally to freight service. To the surprise, or at least the edification, of many concerned, the truck-type locomotive met all requirements of power and speed. The French high-speed tests made in 1955 showed that truck-type electric locomotives could be operated at speeds in excess of 200 mph.

One deterrent in the minds of those considering electrification is that equipment may become obsolete before the full economic advantage of electrification can be realized. The GG1 should put any such thought at rest. No other locomotive in this country, or perhaps elsewhere, for a period of 25 years has delivered so many horsepower hours to the rails. Originally rated 4,850 hp and capable of 9,300 for short periods at some speeds, these locomotives on test have been operated at speeds in excess of 100 mph. They are used both in freight and passenger service. It would appear, therefore, that mechanical obsolescence is not anything about which to be apprehensive.

To what then may we look forward? Railroad men will tell you that the diesel costs too much and that it does not produce enough power. Apparently our designers must go two ways at once. Engines must produce more horsepower and locomotives must be more simple. The builders are moving to meet this requirement with 2,400-hp locomotives, some of which deliver this power through four axles. This calls for precise adhesion control which can apparently be supplied within the limits of cost.

But requirements are not going to stop here if the railroads are going to meet their own competition. One railroad is planning to employ 12,000 hp on freight trains by means of diesel units employing hydraulic drive. So the proponents of electrification look hopefully to the future, saying we can do that easily.

By the same token, the believers in diesel prime movers say we have it—why bother with all those overhead wires?

To Pave the Way

Virtual standardization on the two-trailer piggyback car; the steady increase in cubic capacities of covered hopper cars; indications that the 70-ton open-top hopper may some day be the "small" car, and the adoption of "jumbo-size" wood chip cars all serve to emphasize a new per diem problem. Usually, calls for revision of this rental agreement are based on premiums for low age, good condition or high-grade specialties.

The 85-ft freight car is gaining in popularity. The time may come when these cars will be as common in the freight-car fleet as 85-ft passenger cars in today's passenger car fleet. Certainly, piggybacking offers low-volume shippers the low-volume container to fit their needs. This allows railroad car designers to plan for cars which can be loaded and handled with greater efficiency.

Now railroads and car builders are going all out to provide maximum capacities in many types of cars. Freight rates have always given some incentive for maximum utilization of the revenue space in cars. Many of the new "super" cars are being built to be used in conjunction with incentive rate arrangements. They make possible new earning power for railroads and are inherently more valuable to lines operating them.

Data required by the ICC in the "per diem" case is already being accumulated. The precise material and man-hour costs for car repairs and inspections by most of the Class I railroads are to be used in the Commission's study of variable per diem. This proposal, rejected last year, is now being reconsidered.

It certainly seems to be time for the adoption of a variable per diem system. Modern computers could readily make the calculations involved in its use. Here would be a real incentive for producing the best freight-car fleet possible.

Present per diem offers to car owners the maximum return on the cheapest new cars and the most completely depreciated old ones. Today's railroad operations—and tomorrow's—have little place for second-rate rolling stock. It is time to offer incentives for cars which incorporate the latest technological developments. Excessive loss and damage payments and the costs of frequent car inspections and repairs increase railroad operating costs. They mean that the cheapest car to buy does not automatically become the cheapest car to own. Variable per diem could be a big factor in improving the condition of the American freight-car fleet; it could speed the introduction of cars which can handle traffic on incentive rates and with operating advantages for the railroads and their customers.

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No guess work with . . . . CERTIFIED SIOUX POWER

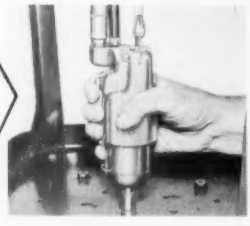
When it's a SIOUX, you know what it will do! SIOUX tells you the torque your air or electric impact wrench will deliver. You don't buy just a wrench. You buy certified SIOUX power, reversible power, and on air wrenches controllable power through eight point power selector.

REACTION BALANCED for Less Vibration Feed Back

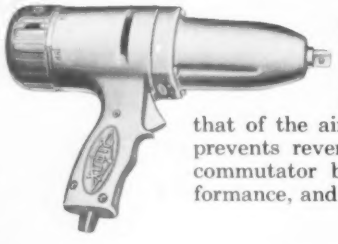
All SIOUX Impact Wrenches are "reaction balanced" for less vibration and torque feedback and for minimum operator fatigue. There's less shock and twist when the wrench impacts. You can feel the difference!

A SIZE FOR EVERY NEED!

From the big No. 322 SIOUX Air Impact Wrench (upper left) capable of up to 1,000 foot pounds of torque at 90 pounds of air pressure, to the little No. 313 (pictured at right) which weighs 2½ pounds and can deliver up to 80 foot pounds of torque, there's a full range of SIOUX impact wrench sizes and models.



SIOUX Electric IMPACT WRENCHES



SIOUX Electric Impact Wrenches offer equal power in right or left hand rotation. The torque for each wrench is stated and certified. Their mechanical design offers exactly the same advantages as that of the air wrenches. Their exclusive reverse cap switch lock prevents reversing with the current on, and eliminates burning commutator brushes and switch contacts. Their efficiency, performance, and freedom from trouble are unexcelled.

Look under **"TOOLS, ELECTRIC"** *in the Yellow Pages*

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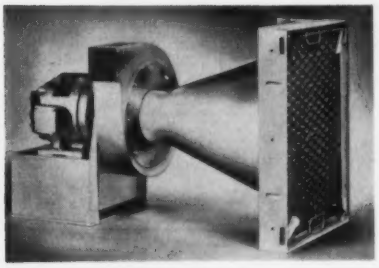
Aluminum Lining for Box Cars

Fifty box cars of the Baltimore & Ohio have recently been equipped with a lining of extruded aluminum alloy 6063-T6. The panels, of tongue-and-groove design, are attached to side posts by blind rivets, producing a smooth surface flush with adjacent wood areas. Each panel is 8-⅝ in. wide. The ¼ in. thick bottom side panels give added strength where most impact occurs. Middle and top sections are 3/16 in. and ⅛ in. thick, respectively. The upper edge of top starter sections fit into standard tongue-and-groove wood linings. Panels for end lining, installed vertically, are 3/16 in. thick. All panels are designed with a maximum unsupported span of less than 4 in. The aluminum lining as installed on the B&O cars is 42 in. high and weighs 1,150 lb per car, slightly more than a conventional wood lining. *Aluminum Co. of America, Dept. RLC, Pittsburgh 19, Pa.*



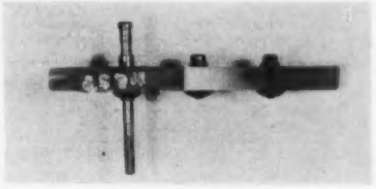
Control Cabinet Pressurizing Assembly Kit

The EJB control cabinet pressurizing assembly kit, No. 100, was designed specifically for heavy duty service and can be applied to any type diesel electric locomotive. The blower and transisition unit are made of heavy gage steel. The filter is an approved railroad type.

According to the manufacturer, an Alco road locomotive unit equipped with the pressurizing kit operated for a period of approximately 15 months, during which time no maintenance was required on contacts, interlocks or other electrical operating parts, and the cabinet required no cleaning. *Edw. J. Boyle Co., Dept. RLC, 1840 Cecil st., Pittsburgh 15.*

Pipe Insulation

Unarco U-200 is a lightweight, rigid, urethane-foam pipe insulation designed for use at temperatures ranging from minus 300 deg F to plus 220 deg F. It has a density of only 2.3 lb and is not affected by most mastics and sealers normally used for cold insulation. The material can be cut quickly and easily with simple hand tools. It is available in half-round sections 36 in. long, or in block form. *Union Asbestos & Rubber Co., Fibrous Products Div., Dept. RLC, 1111 W. Perry st., Bloomington, Ill.*



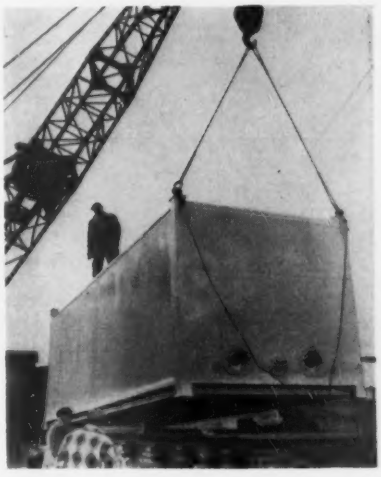
Aluminum-Alloy Pins and Sleeves

The Huck Line of monel mechanical lockspindle (MLS) self-plugging blind rivets now includes two aluminum alloy designs —MLS fasteners fabricated of 2024-T36 aluminum pins with 2117-T4 or 5056-H14 aluminum sleeves. Sleeve and pin materials meet specification MIL-W-7986.

The aluminum fasteners have either protruding or countersunk heads, in the same sizes as the monel design (⅛, 5/32, and 3/16 in. nominal diameter.) Broad grip ranges (1/16-in. increments) in each size is a special feature of the MLS design. Each size is available in a variety of grip lengths.

The aluminum MLS blind rivet is a two-piece design, consisting of a pin and a sleeve with integral locking collar. The MLS pin mechanically locks in place within the sleeve, the locking collar automatically pressing into a conical space between pin and sleeve. Pneumatic or pneudraulic power tools are used.

Minimum ultimate shear strengths of the aluminum rivets are: ⅛ in. diameter, 430 lb; 5/32 in. diameter, 675 lb, and 3/16 in. diameter, 980 lb. Minimum ultimate tensile strengths for the aluminum fasteners (driven) are: ⅛ in. diameter, 276 lb; 5/32 in. diameter, 417 lb, and 3/16 in. diameter, 608 lb. *Huck Manufacturing Co., Dept. RLC, 2480 Bellevue ave., Detroit 7.*



Plastic Cargo Container

An experimental reinforced plastic container now undergoing bulk cargo tests in Texas is said to be one of the largest ever built. The 24- x 8- x 8-ft container weighs 2,800 lb and can carry a 20-ton pay load by rail, motor, or stacked five high for ship transport.

The container consists of 4- x 8-ft built-up epoxy-glass panels bonded to a steel frame. Each panel has a 0.08 in. thick central corrugated sheet of epoxy-glass fiber, with a flat skin 0.1 in. thick of the same material bonded on both sides. The assembly is about 2 in. thick and weighs 64 lb. Heavy cardboard forms the core for the corrugated walls and ceiling. Floor panels, built on an aluminum core, are designed to carry a load of 250 lb per sq. ft. In future models, over 500 lb would be saved by eliminating the steel floor frame and using a monolithic, all epoxy-glass floor.

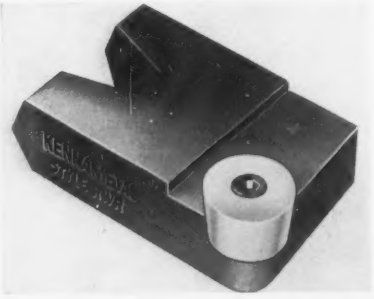
After the panels are bonded to the steel frame, a curved sheet-metal molding is bonded to all right angles in the interior of the container and laminated with epoxy-glass. This provides a smooth, rounded surface for easy unloading. Manhole covers are installed and intake and dumping spouts added. A sprayed epoxy "gel" coat forms a smooth, tough exterior surface.

Another prototype container, soon to be built by an equipment manufacturer, will utilize Union Carbide's plastic materials and epoxy handling techniques. *Union Carbide Plastics Co., Division of Union Carbide Corp., Dept. RLC, 420 Lexington ave., New York 17.*

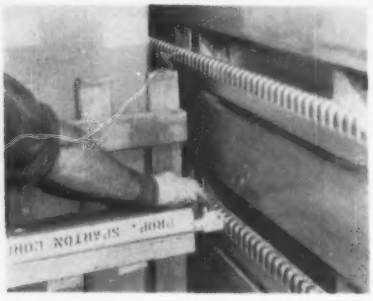
Wheel Boring Tools

New Kendex wheel-boring tools have screw-on type round button inserts. The new Style RWR roughing holders fit stand-

WHAT'S NEW IN EQUIPMENT



ard four-tool type L boring bars for rough boring. Standard Style CDH-42 Kendex inserts, with 1-in. diameter cutting edge, can be rotated to a new edge without disturbing the holder setting and can be resharpened by grinding the top surface. Nearly all requirements can be met with eleven stocked holders. Chip breakers are also available. *Kennametal Inc., Dept. RLC, Latrobe, Pa.*



One-Man Loading System

The standard and fully adjustable loading systems featured in the Easy Loader (SEL) are said to make it the first truly one-man freight-car loading system. The standard SEL system is composed of a series of 7, 8, 9 or more steel belts mounted flush with the inside walls of the car. The number of belts can be adjusted to fit the need, depending on the type of service in which the car is used. The belts have slotted grooves 1 in. apart. Semi-automatic unlocking cross-members are extended across the width of the car and fitted in the channels to lock loads firmly in place.

The adjustable system has removable side rails that fit into T-slots, 1 in. apart on vertical hat section channels fixed in place during car construction. Side rails can be adjusted to any level or location for design changes in automobile parts, eliminating the need to relocate the fixed rails. Installation of pre-cut panels between, and flush with, the vertical side channels, plus opening in bottom of hat section for cleaning, makes the car suitable for bulk lading. Several types of cross-members have been developed, including a 6,000-lb aluminum bar weighing about one-half the conventional steel type.

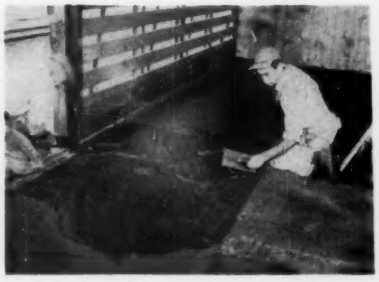
A Pennsylvania box-car, expressly built for the fully adjustable system, was displayed in Detroit in January, along with a standard equipped car owned by the Western Pacific. *Allied Steel & Conveyor Div., Sparton Corp., Dept. RLC, 17333 Healy ave., Detroit 12.*

Unitized Pallet Pack

Minimization of damage, reduced lost-in-shipment risks, and single bulk shipment are advantages claimed for the unitized pallet pack in which Spring-Pak lubrication pads are now shipped. Each unit contains a standard number of items, and the complete load can be moved by fork truck. Because of the more efficient stacking possible, less storage space is needed. *Spring Packing Corp., Dept. RLC, 332 S. Michigan ave., Chicago 4.*

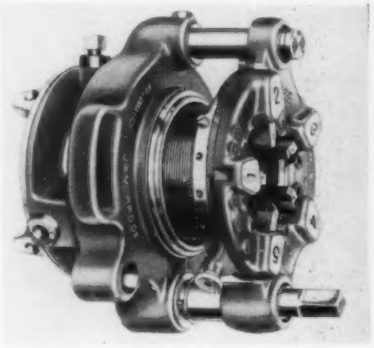
Air Chisel

The Sioux Slugger is designed to shear metal, cut metal, cut rivets, drive rivets, scrape metal, break welds, punch sheet metal holes, split nuts, shear bolts, pull pins, drive bearing races and pressed bearings, and crimp sheet metal. Its one-piece barrel has no parts to become misaligned or worn. The handle is cast iron. Seven attachments are available. *Albertson & Co., Dept. RLC, Sioux City, Iowa.*



Resurfacing Compound

Roc-Wood "Diamond Hard" floor resurfacing compound consists of chemically treated hardwood fibres bonded with non-asphalt derivative plastic binders. It is said to withstand up to 6,000 psi and provide a smooth, non-porous surface ready for foot traffic in 8 hr and heavy traffic in 48 hr. According to the manufacturer, the compound is acid resistant and skid proof. Experimental applications over the past five years show it is particularly adaptable to new and conversion stock cars. It can also be applied to baggage, mail, and head-end cars. Floors are swept and cleaned, a layer of tar paper laid down, then sections of wire screen mesh. The material is worked into the mesh and troweled to a thickness of ½ to ⅝ in. It weighs about 3 lb per sq ft and sets through chemical reaction without shrinking. *Western Railroad Supply Co., division of Western Industries, Inc., Dept. RLC, 2742 W. 36th Place, Chicago 32.*



Geared Threader

The Rigid No. 141 jam-proof geared threader threads 2½-in to 4-in. pipe on conduit without changing dies. One set of dies threads 2½, 3, 3½ and 4 in. Threader adjusts quickly for straight or tapered, over and under size threads. A cam-action work holder sets exactly to size by turning the adjusting collar. For threading 4- to 6-in. pipe without changing dies, the Rigid No. 161 jam-proof geared threader also has the fast-action cam-type work holder. *Ridge Tool Co., Dept RLC, Elyria, Ohio.*

Because Armco Wheels are rolled

they keep rolling longer

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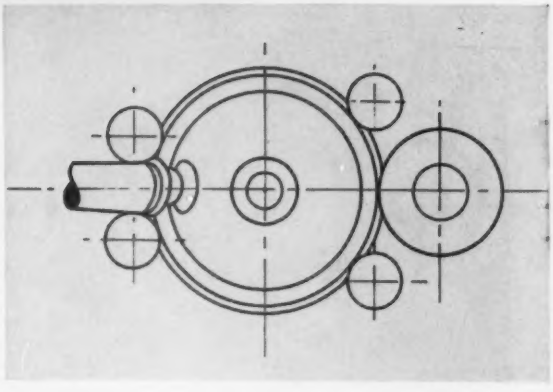
Powerful rolling pressures impart greater strength and toughness to wheels during working to final size.

From 1932 to 1957, Armco shipped more than one million one-wear wrought steel wheels. Only six of these have been reported defective. This is 99.9994% performance. Forging is one big reason. Here's another:



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three of the things that make Wyandotte cleaning

Painstaking research can develop an excellent cleaning product. Strict quality-control standards can assure that it will be duplicated in quantity. But unless, at the point of use, there is a practical, down-to-earth understanding of the special problems that product is designed to solve . . . it cannot work to full advantage.

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Wyandotte research is broad in scope, and to the point. Our facilities for cleaning-product research are unequalled in the industry. Because we are constantly improving existing products to meet present needs better . . . and developing new products to handle new problems . . . we offer a complete and up-to-date line of cleaners for every railroad requirement.

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Wyandotte service is in the hands of experts who deal with railroad-cleaning problems *exclusively*. Your Wyandotte cleaning specialist is assigned permanently to your line. He devotes his attention to your problems. He knows when, where, and how to use each Wyandotte product for best results at lowest use-cost.

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...now, and in the years to come!

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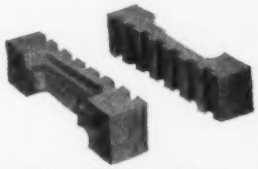
With this background of experience, Magnus is continually investigating new designs of journal box components for still greater efficiency and economy in railroad service. Whatever the future may hold, of this you can be sure. Tomorrow's rolling stock will ride on Magnus bearings—bearings that are right for railroads, in performance and in cost. For further information on Magnus bearing products, write to Magnus Metal Corporation, 111 Broadway, New York 6, or 80 E. Jackson Blvd., Chicago 4, Ill.

Magnus Solid Journal Bearings



Magnus R-S Journal Stops

Magnus Traction-Motor Support Bearings

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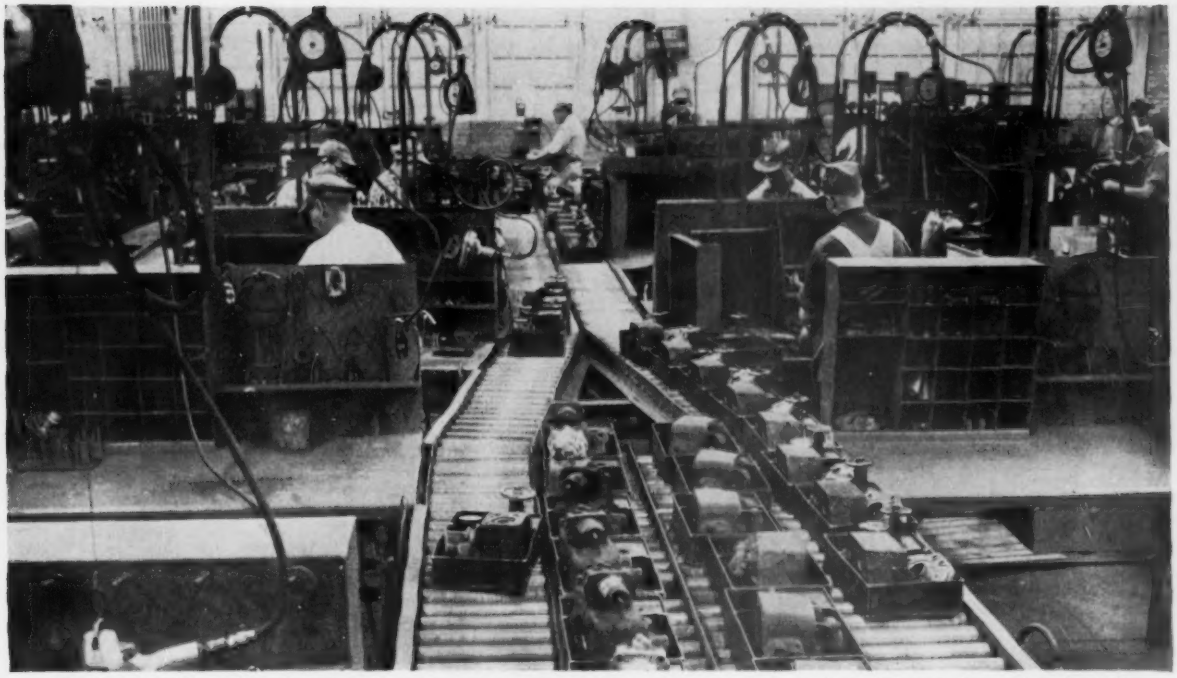


Stripping, assembly and repair stations line the center conveyors. During process, valves are cleaned, inspected, gaged, and rebuilt.

L&N Mechanizes Brake-Valve Repairs

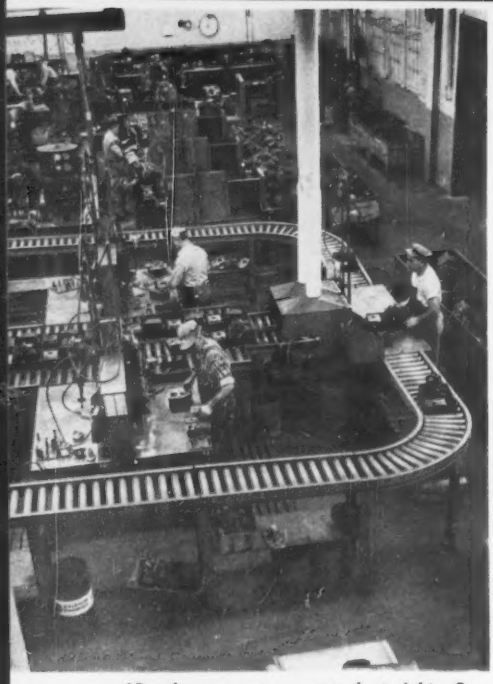
THE LOUISVILLE & NASHVILLE believes a good prescription for avoiding serious delays and troubles with air-brake equipment is a thorough maintenance program. Its South Louisville, Ky., shops recently renovated air-brake department centralizes most of the maintenance and repair of locomotive and car brake equipment under one roof. Improvements include fluorescent lighting, forced-air heating for cold weather, ventilating fans for summer, a distinctive color scheme, and modern washing facilities.

With newly installed roller-conveyor systems, modern repair equipment and carefully planned work flow, some 1,400 valve sets are cleaned, oiled, repaired and tested each month. In addition, many other related parts are processed and air compressors completely overhauled.

The 142- x 79-ft shop is divided into four basic departments—freight-car, passenger-car and locomotive air brake repairs, and air compressor repairs. There are 44 carmen, 21 machinists, three apprentice machinists, two laborers and two supervisors. Freight-car brake valves are reconditioned every four years; those on the latest type passenger cars, every two years; older passenger car equipment, every 12 to 15 months, and locomotive valves, every six months. Air compressors are overhauled on a locomotive mileage basis.

In the freight-car section, which is the most highly mechanized, there are two identical roller conveyor systems. Work benches and test racks are alongside. Walking and lifting have been eliminated. A one-direction flow of work has been established. In the set-up are automatic blowers and a lapping machine. There is an additional lapping machine in the passenger-car line. One conveyor line handles the service portions and the other the emergency portions. Impact tools are used for disassembly and reassembly operations, and there are power wire brushes at disassembly points. At each assembly-and-repair bench are individual cleaning facilities and a storage rack with new and repaired parts. Lines are supplied daily with all necessary repair materials.

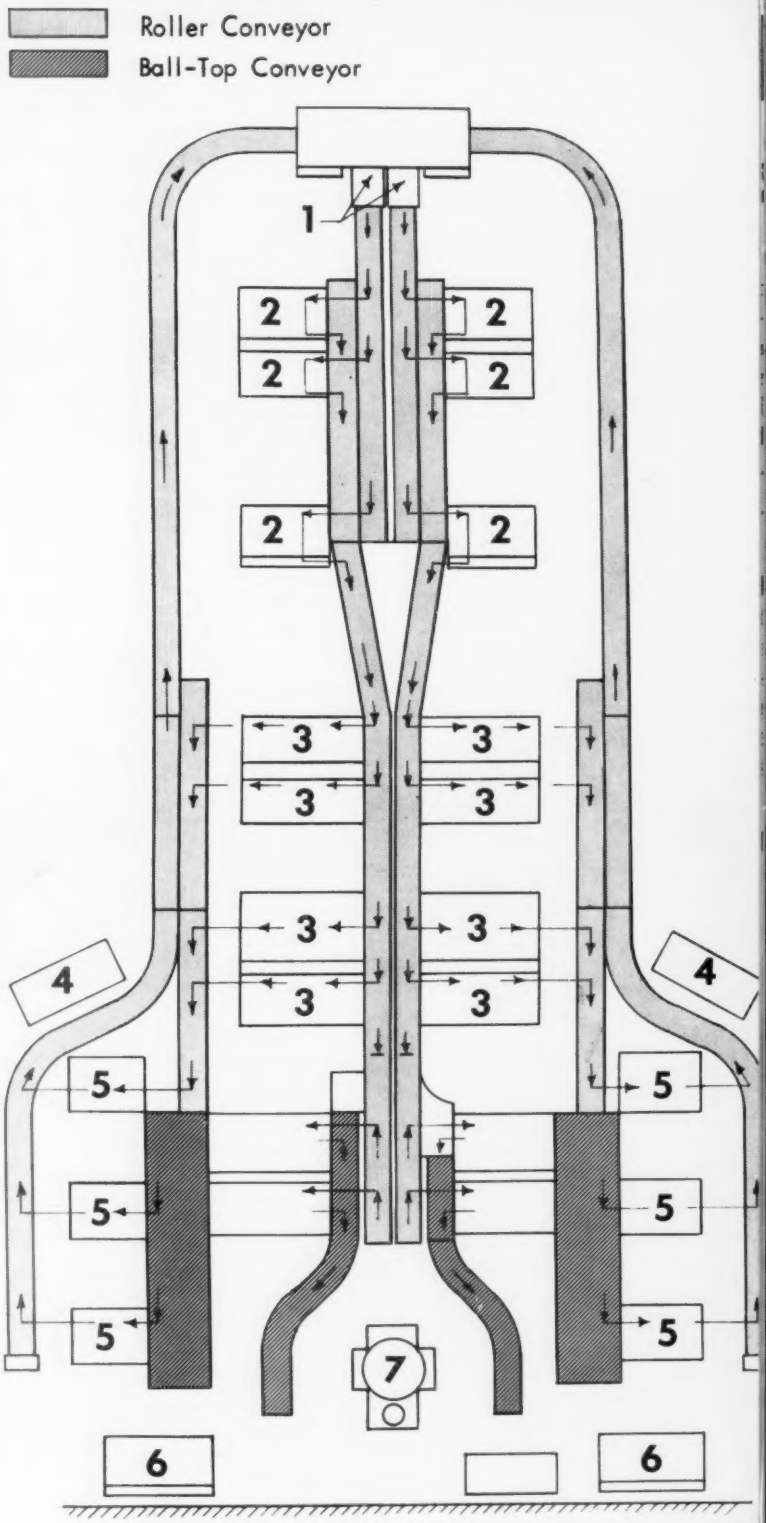
Valves to be repaired are brought into the shop on skids and placed in individual metal pans. After shipping covers are removed, the valves are put through the blower which removes most of the loose dirt. Placed on the gravity conveyors, the valves then move to various stations where they are disassembled, parts wire-brushed, inspected and gauged, and broken or defective parts replaced. Reassembly follows after careful cleaning. In the final operation, the valves move to any one of 14 AB test



AB valve covers are removed at right. Conveyor moves valve through blower, air blast in which, after doors are closed, clears loose dirt.

Small AB valve parts are reworked on bench at right. Repaired and tested valve on conveyor at right is returning from test rack.

Benches at right and left are reject repair stations which rework valves from test racks.



1 - Air Blower Cleaners
2 - Stripping Table
3 - Assembly Table
4 - Miscellaneous Tab
5 - Test Rack
6 - Repair Table
7 - Lapmaster Machine

racks for operational checks in compliance with the AAR test code. Valves failing to pass the test rack go to reject repair stations where they are disassembled, examined, parts gauged for accuracy, and reassembled for retest.

Bench repair locations process the smaller number of more specialized passenger car and locomotive valves. Air compressors, removed from locomotives after six years' service, are given complete overhauls. The compressors are disassembled and sent to the cleaning vats. After cleaning, all worn or defective parts are renewed, and the compressors rebuilt to the builder's specifications.

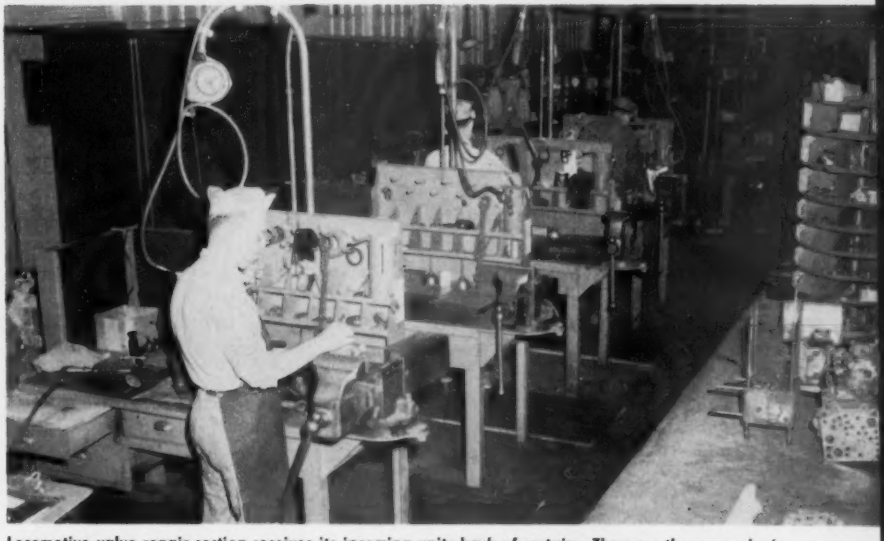
The air-brake department's schedule includes 3,000 valve sets to be applied to new cars for 1960 delivery. These valves, which will be removed from scrapped cars, will be reconditioned and furnished the car builder for application.

Angle-cock section of the air-brake shop processes valves for entire railroad. An important tool is the Ex-Cell-O machine on the right in which the bodies and keys are reworked. L&N has been able to arrange these auxiliary operations around AB valve line.

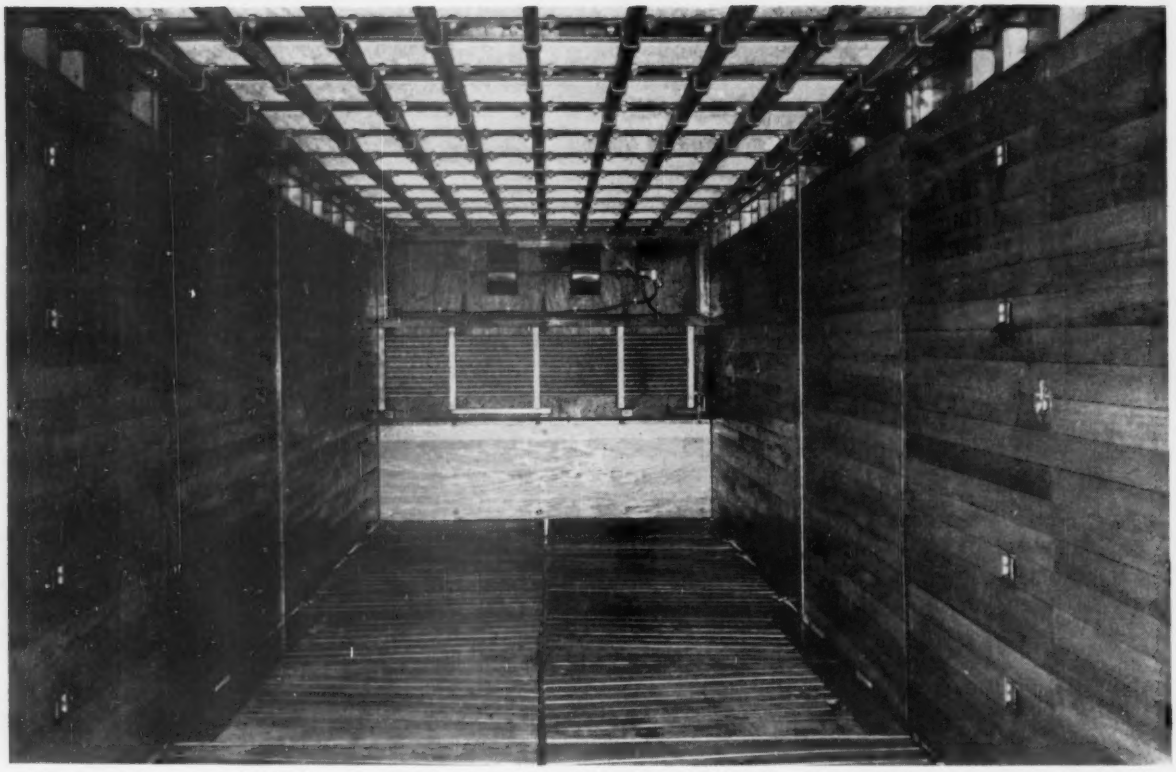
Passenger valves are reworked on benches at left. Bench on right is storage area for the valves awaiting testing. Extreme right bench is the one on which repairs are made. Volume does not warrant a conveyor system for this type of equipment.

Round wire brush on air tool is used for cleaning flat valve surfaces; cup brush at end of shaft, for cleaning irregular surfaces.

Shop has 14 AB test racks. Containers with valves move easily on the ball-top tables.



Locomotive-valve repair section receives its incoming units back of curtain. They are then reworked on the benches and placed on the table at extreme right to go to the test racks.



Interior of MNX car shows installation of evaporator coils and fans which are driven by the hydraulic motor which is also mounted on bulkhead.

Direct Drive for Mechanical Reefer

MNX 2389, an experimental mechanical refrigerator car, has foamed insulation and the first application of a Mercedes-Benz diesel engine with direct-connected compressor. This roller-bearing equipped car has nine meat rails running through its 34-ft inside length and is one of the 755 meat-rail refrigerator cars operated by the Burlington Refrigerator Express Co., a wholly owned CB&Q subsidiary.

The mechanical refrigeration and heating system used on MNX 2389 was developed to provide low-cost, reliable operation. Most mechanical cars have an engine-generator which powers the refrigeration equipment and provides a-c power for heating. Development was to give a unit with the dependability and the refrigeration capacity of present systems at a much lower first cost. The compressor is directly connected to the diesel engine. Major cost reductions came from the elimination of the a-c generator and compressor motor. Efficiency losses in the generator and motor can run as high as 25 per cent overall. Clutches are eliminated and the engine is loaded at all times.

The polyurethane foam insulation in the car has good thermal insulating properties with an initial heat transmission (k) factor of 0.11 that increases in about a year to 0.17. It has a 97 per cent closed cell structure.

The car has the following insulation thicknesses: floors, 6-⅛ in.; sides, 6-11/16 in.; ends, 6 in. and 6-7/16 in., and roof, 10-5/16 in. average. Tests have shown the car heat leakage to be 8,336 Btu/hr at 100 deg temperature differential. This compares to approximately 12,000 Btu/hr for a car with conventional insulation.

In the development of the polyurethane insulation, the moisture problem was a prime target. All insulations and installation procedures were studied. Loose fill and fibrous types were eliminated because they require a vapor barrier. Cellular plastic type materials appeared to have the most promise. Early experiments used expanded polystrene applied in an adhesive mastic which bonded the insulation to the structure and sealed the edges of the insulation. This proved to be an effective insulation, but installation costs proved excessive.

Early experiments with rigid polyurethanes were based on a castor-oil type which could be foamed in place to seal the structure. However, the material was only 60 per cent closed cell which left the moisture absorption problem. In addition, this material became brittle and crumbled with age.

Next step was the polyester based, carbon-dioxide-blown urethane foam. This ran 80 to 90 per cent closed cells. Uniform foam could be produced. The foaming action of this material was caused by the generation of carbon dioxide gas during the initial chemical reaction. Therefore, all the cells in the insulation were filled with CO_2, which resulted in a "k" factor of 0.21.

Application machinery for foaming-in-place was developed. The material, when foamed in place, had excellent

adhesion to steel and wood and filled all minute openings in the structure. It could flex with the movement of the car structure.

Next, polyether and other polyester resins were investigated. A flame retardant was added. Fluorocarbons were used as blowing agents instead of carbon dioxide. Fluorocarbon blowing agents, in this case Freon 11, produced a "k" factor of 0.11. This permitted a reduction in the insulation thickness which made the material competitive.

Specifically, the material consists of a long chain polyether reacted with a polyester resin through the urethane linkage during the chemical reaction. The foaming action of the material is caused by the vaporization of the Freon 11. The initial reaction is exothermic, which raises the temperature of the mixture above the boiling point of the Freon 11. Since the foam contains Freon 11 in each cell, it is impervious to moisture.

The entire interior of MNX 2389 was stripped in preparing for foamed insulation application. Holes were bored in the floor. Insulation was then pumped in to fill the space. It was forced up the sides of car between the new lining and the outside steel sheathing a distance of about 12 in. More of the material was pumped through holes in the roof into the sides and, finally, into the space between the ceiling and roof.

Problems accompanying direct drive include power for air circulating fans in the car, a source of heat for heating and defrost, and temperature control. Such a unit could not be placed on standby power in event of an engine failure and requires a dependable engine. Noise had to be kept to a minimum.

The engine used is a Mercedes-Benz Model OM 636, four-cylinder, four-cycle diesel engine. Fuel consumption of the engine is low and elimination of electrical losses aids fuel economy. Tests have shown the fuel consumption to be less than ½ gal per hr.

The compressor, built by Sterling Refrigeration Engineering Co., is driven by a rubber-in-shear coupling. It is an 8-cylinder design with four banks of cylinders, with 30 deg radial spacing. Timken main bearings are used. Suction and discharge valves are of the ring type.

Condenser and radiator are combined in a coil mounted ahead of the engine. The condenser-and-radiator fan is mounted directly on the engine crankshaft and draws the air from the side of the car.

Air-circulating fans are hydraulically driven. The pump for this system is belt-driven from the engine. The hydraulic motor, located in the car, drives the two air circulating fans directly. During periods of defrost, the motor is unloaded by an electric solenoid which stops the fans. Normally, fans operate continuously, assuring uniform temperatures in the car.

Heating and defrost are accomplished by means of a modified reverse cycle in which the hot gas from the compressor is directed to the coil inside the car. When heating is required, a changeover valve directs the discharge gas to the evaporator and isolates the condenser and liquid receiver. The hot gas condenses in the evaporator and is evaporated in the surge-tank accumulator located in the suction line. The Partlow temperature control is designed to provide four stages of control—high-speed refrigeration, low-speed refrigeration, low-speed heating and high-speed heating.

Automatic defrosting is eliminated. Cooling fins are spaced so that a frost build-up will not cause a fall off in air circulation. The type of insulation used in the car prevents moisture infiltration. The temperature control will melt any minor ice accumulation on each cycle. Coil size and quantity of air circulated are such that the coil temperature is within a few degrees of the load temperature, which minimizes the condensation and frost on the coil.

Because coil temperature is so close to the load temperature, there is a minimum of fresh-load dehydration. Condensation that does occur will be re-evaporated during the low-speed heat cycle of the temperature control and returned to the load. This system has now undergone a year of testing to determine dependability and performance.

Direct-drive diesel unit has been installed in compartment which usually contains the diesel-driven alternator on similar refrigerator cars.

Single-cab 4,000-hp A-units with dynamic braking for the D&RGW and another Western road will be patterned after this 3,000-hp locomotive.

U. S. Roads Order Diesel Hydraulics

Locomotives to be built in West Germany patterned after 3,000-hp unit now in service

Orders for six 4,000-hp German diesel-hydraulic locomotives by two western U. S. roads has heightened interest in the prototype. The prototype is a 3,000-hp locomotive which has been in service since June 1958 on Austrian and German railroads. Like the 3,000-hp locomotive, the six 4,000-hp units for U. S. service will be designed and built by Krauss-Maffei of Munich, West Germany. They will probably be in operation early in 1961.

A standard road locomotive on the German Federal Railways is the four-axle 2,200-hp model with each of its two trucks driven by a separate 1,100-hp high-speed diesel and hydraulic transmission. In 1957, Krauss Maffei turned out four 2,200-hp units similar in appearance to the standard German locomotives, but each mounted on two six-wheel trucks to comply with lighter Yugoslav axle loadings. Three were built for the Yugoslav Railways, and the fourth went into experimental service. After some months of running, the experimental locomotive was taken back into the works and equipped with two charge-aircooled engines giving 1,500 bhp each and two new sets of transmission to take up the higher output. Installation of the more powerful engines and transmissions was effected with practically no alteration—the only real difference being a somewhat higher cab floor height to accommodate the larger transmission unit. A 15-notch control system replaced the original six-notch control. The intermediate gear between transmission unit and axle drives was replaced with one capable of taking the higher output and of a top speed of 87 mph. Original Maybach axle drives did not need modification.

The ML 3000 locomotive weighs 103 tons with all supplies and includes train-heating equipment. Length over buffers is 66 ft 6 in. Axle loading is 16.9 tons and "provides ample adhesion for almost all requirements outside of North America."

Superstructure and Framing

The locomotive body structure is built up on two large-diameter longitudinal tubes arranged approximately on the center lines of the buffers. For transmitting tractive effort forces, as well as for bearing the vertical loads, two longitudinal continuous steel-plate girders have been provided in the middle of the frame. The combined frame

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Technical information in this article is based on an article appearing in the September 1959 issue of Diesel Railway Traction and abstracted with the permission of Tothill Press, Ltd., London, England.

and body structure is stiff enough to withstand buffing pressures of 200 tons without permanent deformation.

The space inside the body is symmetrically subdivided about the central train-heating boiler compartment, on each end of which is a radiator section, an engine compartment, and a cab, with a short nose in front of it. All compartments in the main body have detachable roof hatches.

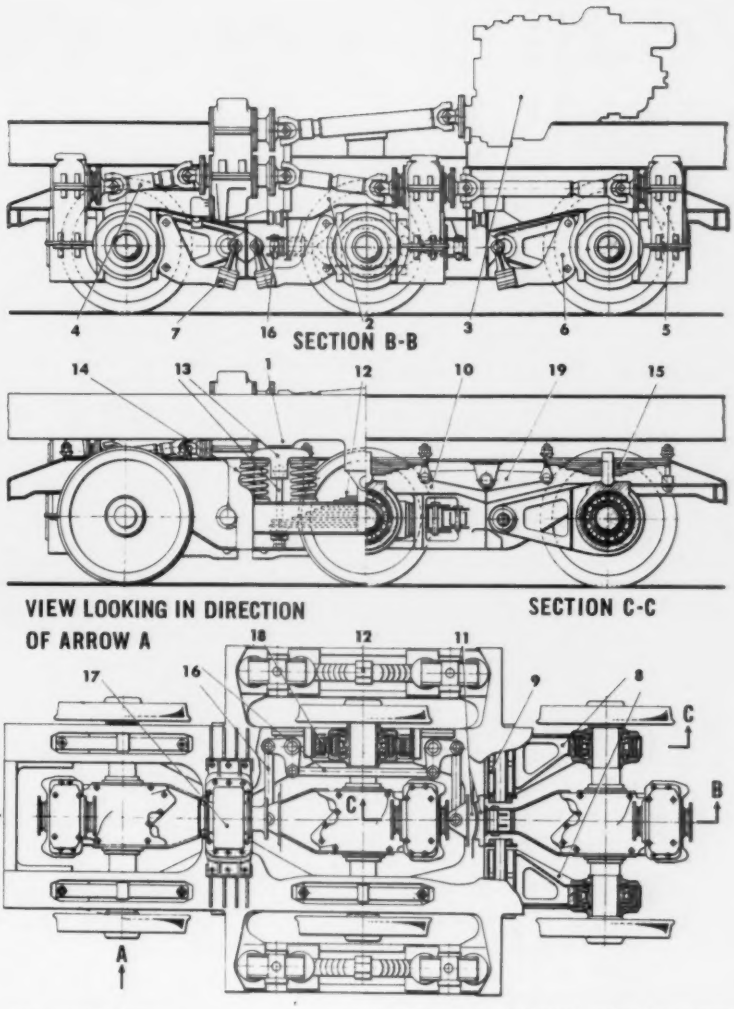
Trucks

Through a development of the pivotless two-axle truck used so successfully in the V. 200 type locomotives in Germany and Great Britain, the three-axle truck can be said to be a novel design. Its general arrangement is adapted to the special conditions imposed by cardan-shaft drive and, simultaneously, to provide good riding qualities and a substantial reduction of wear in operation.

Layout of the power-transfer line between the hydraulic transmission and axles does not permit use of the conventional center plate. The pivot is replaced by an angle-lever and rod system linked to the truck frame and to the protruding main frame extension. Center lines of the truck and the main frame interset at any time in one point, the ideal pivot point of the truck. This linkage does not transmit the tractive and braking force. They are taken by special manganese steel liners attached to the main frame extension and the matching rim of the truck cutout.

The intermediate reduction gear, the casing of which is rigidly connected to the truck frame, allows short cardan shafts to be used between the flanges of the driven shaft and the axle drives. The reaction force of the torque of the latter is transmitted to the frame via torque supports and Silentbloc rests. The rigidity of the box type welded axle-guiding arms, which are hinged in rubber blocks, insures good riding of the locomotive and elastic absorption of side force occuring at the wheel flanges. In a similar way the rubber-lined joints of the lever and rod system damp out the undesired oscillating motions of the truck.

Vertical loads are transmitted from the main frame to the wheels in two steps. The frame rests on the buckles of four laminated springs arranged lengthwise in the truck frame which, in turn, are suspended in cantilever supports of the truck frame through coil springs. The wide support of this soft



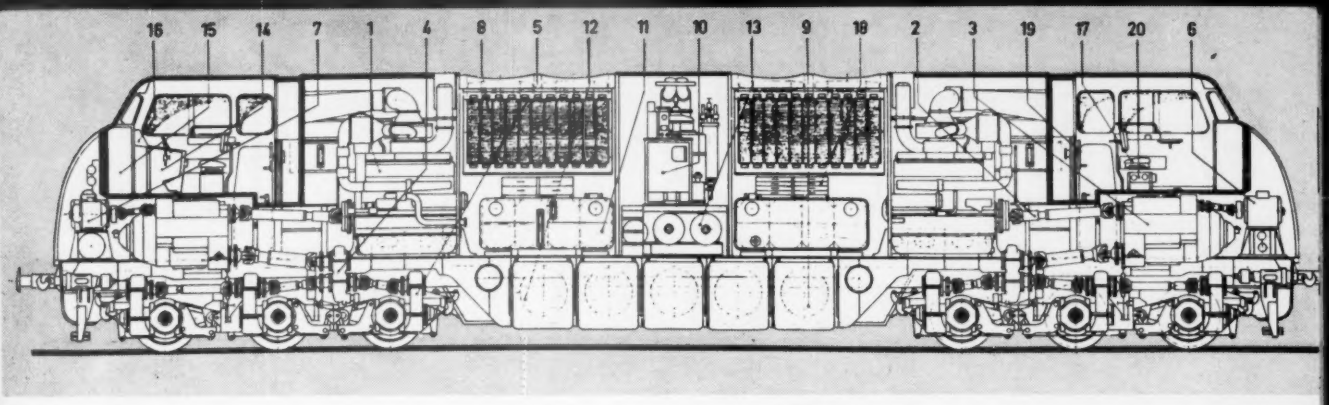
1. Stop on main frame
2. Projection of the main frame
3. Hydraulic transmission gear
4. Cardan shaft
5. Axle bevel drive
6. Torque support
7. Suspension elements of torque support
8. Axle-guide pendulum
9. Silentbloc for axle guide pendulum
10. Truck frame
11. Thrust face of hard manganese steel
12. Underframe laminated spring for secondary springing
13. Pendulum spring bolt with thrust cap
14. Helical spring for secondary springing
15. Laminated axle spring for primary springing
16. Guide linkage
17. Distributing gear
18. Axle-box liner
19. Equalizing beam

U.S. Railroader Comments on German Road Tests

At the ASME-AIEE Railroad Conference in Chicago a year ago, P. V. Garin, manager of research and development of the Southern Pacific, commented on this locomotive: "Locomotive unit ML-3000 represents the maximum output achieved so far with diesel-hydraulic drives . . . The performance expected from the locomotive was fully realized. Heavier trains were handled on reduced schedules. Tests were made by stopping on grades with a heavy train and permitting the train to roll back. Engine overcame this 'draw down' and started up the grade with no overheating of transmission fluid. Tractive effort on level reached a maximum of about 84,000 lb.

"The coefficient of adhesion reached without sanding was 37 per cent . . . With our diesel locomotives having d-c traction motor drives, the normal factor of adhesion achieved is 18 per cent. This means that the diesel-hydraulic drive, with axles mechanically linked together, has more than twice the adhesion value of the d-c drive. This more favorable tractive-effort to weight-on-drivers relationship is a definite advantage of the hydraulic transmission. . . .

"The mechanical-hydraulic or full hydraulic transmissions are worthy of serious consideration, particularly where heavy mountain grade operation is encountered and the continuous or 'short term' rating of traction motors is a critical factor in operating practices."



1. Engine
2. Universal joint shaft
3. Mekydro hydraulic transmission
4. Distribution-reduction gear
5. Axle drive
6. Dynastarter
7. Oil pump for cooling fan drive
8. Cooler
9. Tank for diesel oil
10. Train-heating boiler
11. Tank for boiler feedwater
12. Tank for boiler fuel oil
13. Compressed-air brake reservoirs
14. Engineman's desk
15. Switchboard panel
16. Instrument board
17. Folding seat
18. Tool kit
19. Hand brake
20. Air-heating and defrosting apparatus

suspension prevents excessive rolling.

The direct suspension of the main frame in the buckles of the laminated springs at both sides and the pendulum suspension of these in the long hangers and coil springs have a recentering tendency in case of the truck being off the center line, counteracting, veering and hunting. If the truck is out of alignment, these hangers give the necessary displacements between main frame and truck by tilting and, in this respect, are analogous to the cardan shafts in power transmission. The mushroom-shaped caps of the spring hangers are intended to take up excessive side deflections of the frame which may occur at high speeds over uneven tracks. Under normal conditions, however, no contact does occur with the corresponding stop faces of the frame.

The comparatively small wheels (37.4 in.), together with the relatively light bevel axle drives, cause only small track stresses. Axles run in self-aligning roller bearings. In order to eliminate wearing faces, the roller bearings are guided by pendulums which are attached to the truck frame by rubber joints. Rubber joints are also used in the angle lever and rod system.

The locomotive has electrically driven piston-type air compressors and a complete air-sanding system.

The storage batteries of 110 volts and 300 amp hr capacity are slung in boxes below the underframe. They are continuously charged by the dynastarters, which also serve as charging dynamos and as engine starter motors. For heating passenger trains and for preheating the engines there is a Vapor 1,800 lb per hr, fully automatic, oil-fired boiler.

Each Maybach MD 655 V-type engine has 12 cylinders (185 mm by 200 mm) set in two banks at an angle of 60 deg. They are supercharged. At 1,500 bhp (1,590 rpm) the bmep is 187 psi. An after cooler is used.

The principal features of this engine are the one-piece cast-iron block tunnel crankcase and two cylinder banks; the short disc-webbed crankshaft with the webs surrounded by the roller main bearings; a two-piece piston cooled by an entirely separate pressure-oil circuit; a unit injection pump injector unit for each cylinder, and three inlet and three exhaust valves per head. There are two gear-driven camshafts for each cylinder bank, one operating the inlet valves and the other the exhaust valves. Design of the disc webs and main bearings leaves ample room for crankpin bearings of the fork-and-blade connecting rods.

The engine fuel oil is stored in main tanks suspended between the frames. Electrically driven transfer pumps lift the fuel continuously to service tanks in the roof, from which the fuel flows down to the injection pumps by gravity.

Radiators are independent of each other and are designed as symmetric lateral coolers located at the sides of the roof. Air outlets are in the top of the roof. The fans have Behr hydrostatic drive. Each diesel engine drives a multiple-piston oil pump connected by a pressure line with the pressure-oil motor of the corresponding fan. Pressure and flow of oil is controlled by thermostats.

Cooling water flows in a single circuit through the water radiator, the engine housing, and the gear-oil and engine lubricating-oil heat exchanger. It can be preheated or kept warm by steam from an outside plant or from the steam generator.

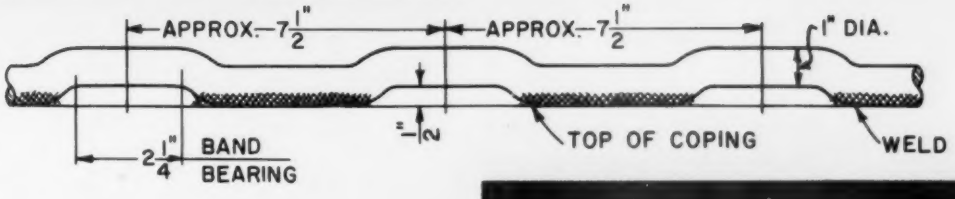
The free ends of the two engines are toward the center of the locomotive. At the driving end of each, an elastic coupling is fitted at the engine flywheel. Cardan shafts extend to the two Mekydro transmissions located below the floor of each cab. From the output shaft of the transmission, another cardan shaft leads inward again to a spur reduction gear supported on the truck frame and located about midway between the center and inner axles. One cardan shaft goes to the non-reversing bevel drive on the inner axle of the truck, and another goes forward to the center and outer axles. The reversing gear is incorporated in the Mekydro drive.

This K.184 Mekydro drive is driven through a step-up gear of 2:1 ratio. It has the principles of the existing Mekydro transmission—a permanently filled hydraulic torque converter with axial disengagements of the turbine portion, followed by a speed-change box completely automatic in operation (RL&C, Sept. 1955, p 77 and June 1956, p 58).

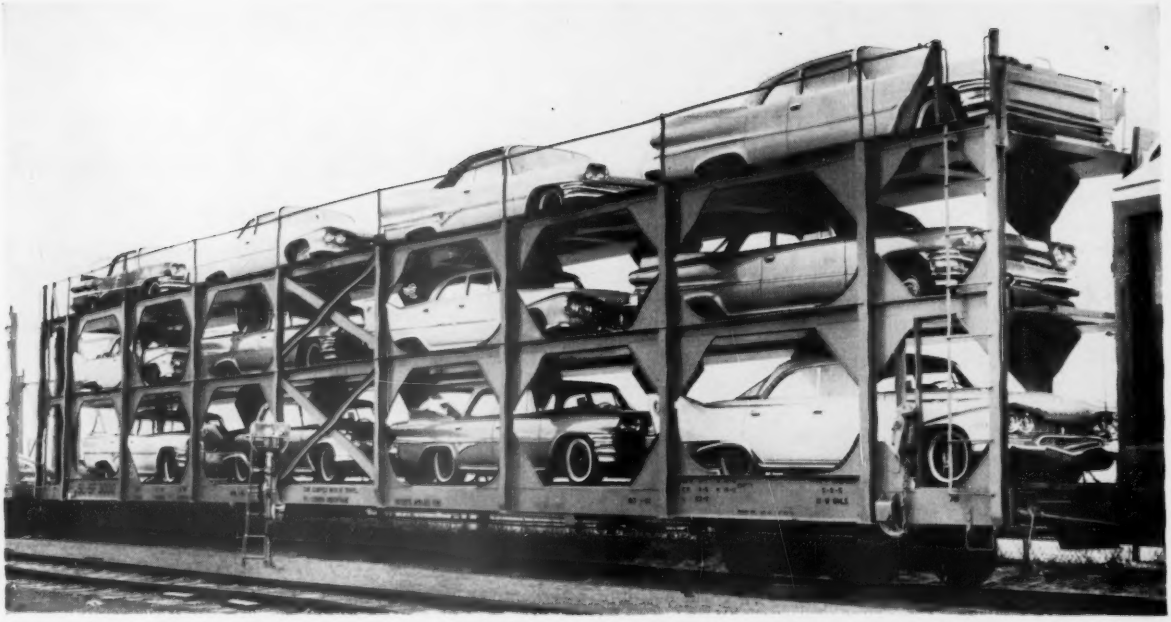
Control of the individual speed changes and coordination of the various speed-change procedures is effected by a hydraulic control mechanism within the transmission housing. The automatic speed changes take place at track speeds of 24.2, 38.5, and 63.5 mph.

The locomotive is controlled by 15-notch controllers. Contacts of the switch control the Mekydro transmissions and diesel engines. The transmission is brought into the operating position electro-magnetically, after which it is fully automatic, governed by track speed. Engine speed and output are increased by turning the control switch from notch to notch until the maximum (notch 15) is reached.

Continuous
LADING BAND ANCHORS
..an anchor every 7½ inches

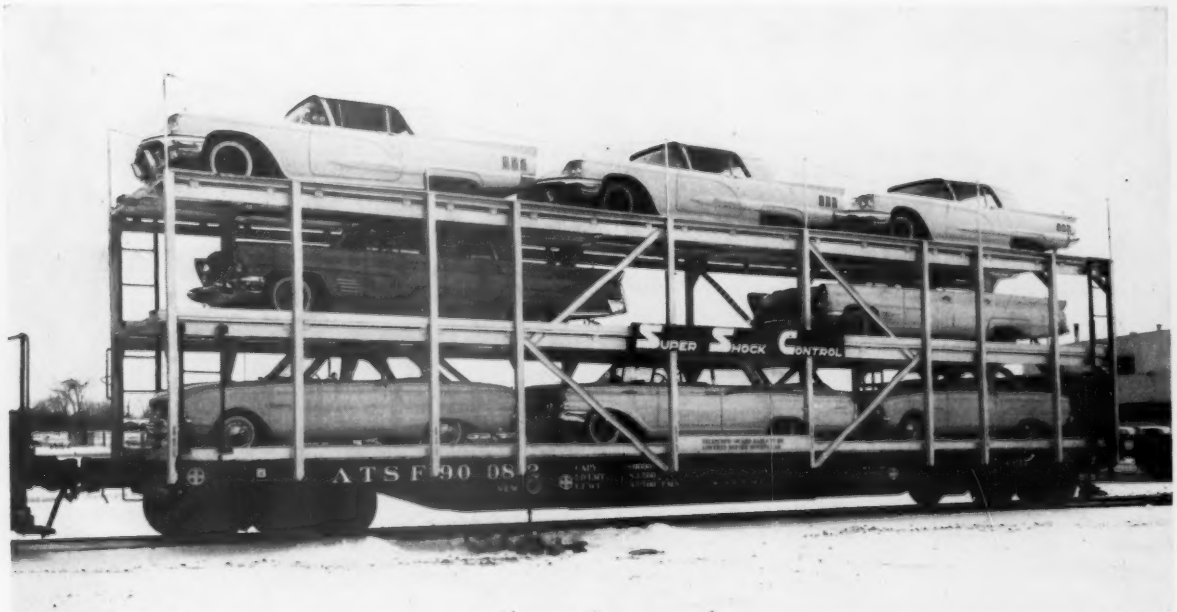


Special 1″ round section, deformed to provide multiple banding locations at 7½″ intervals. This continuous type anchor is best adapted to the top coping of gondola cars. Composite lengths available for various car design requirements. Individual cast steel anchors for end strapping complete the application.



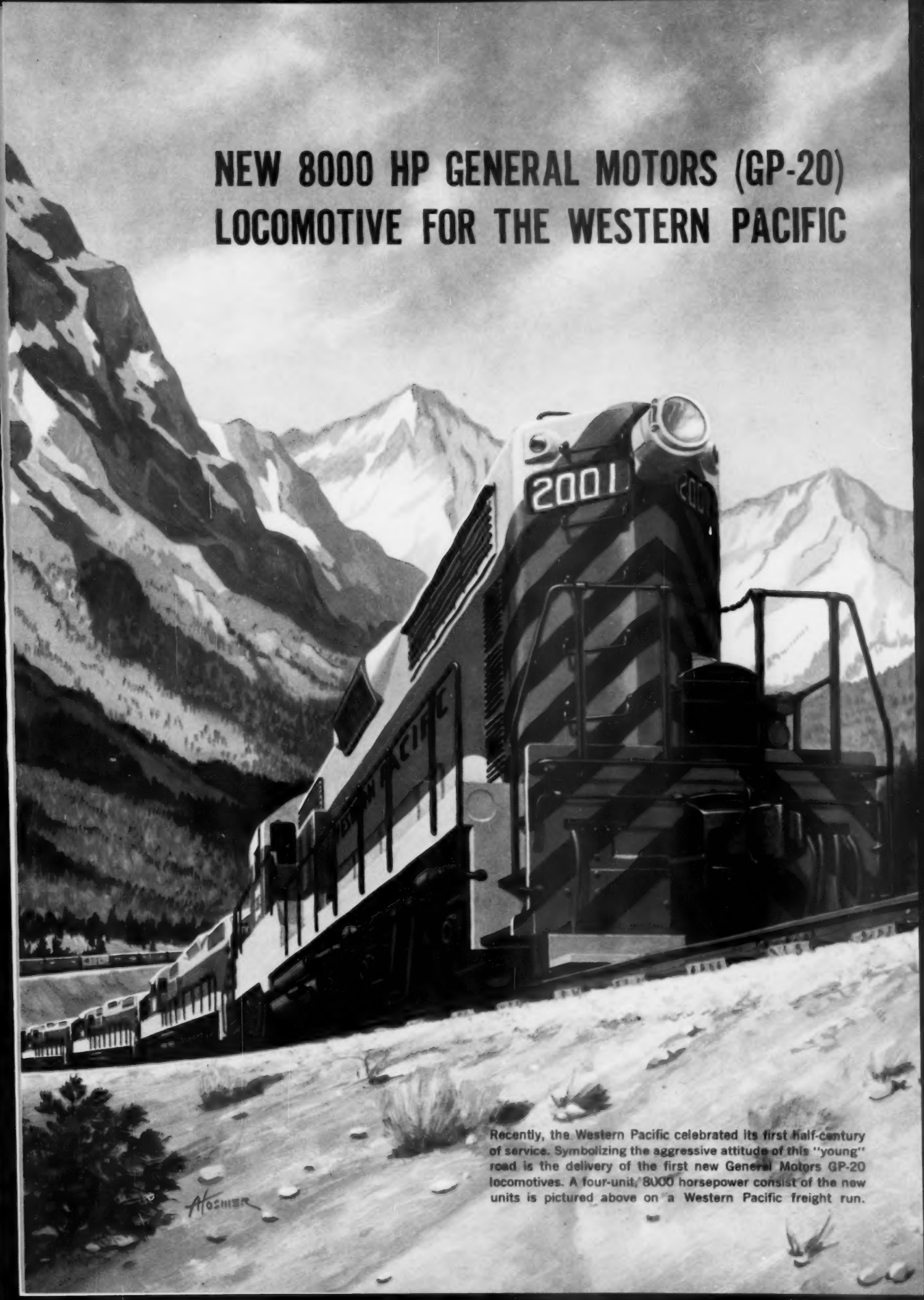
Frisco hustled its new 83-ft (85-ft over strikers) automobile flat car into operation early last month. Pullman-Standard's Michigan City, Ind., plant built the car in just 21 days. Frisco has it hauling both standard and compact automobiles. Special equipment on the car includes the P-S 10-in. travel cushion underframe; guard rails on the top deck; bridge plates on all three decks to permit piggyback-style loading, and ladders on all four corners to give drivers easy access to the upper decks. The car weighs 138,000 lb empty, and stands 16 ft 10¼ in. from rail to top of guard rail. With cars loaded on the upper deck, overall height becomes 18 ft 4 in., still well within clearances over all Frisco lines where the car will be used. Frisco built companion ramp car to make possible loading and unloading during tests.

Autos Move on Triple-Deck Cars



Three-deck automobile transporter, constructed by the Santa Fe, is now in service between Detroit and the West Coast. Car was equipped with the 18-in. travel hydraulic super-shock control underframe (RL&C February 1960, p 19), along with two other cars—a flat and an insulated box car. It is 53 ft 6 in long and can carry 9 standard autos or 12 compact models. Super-shock control underframe is a refinement of the original shock-control underframe introduced two years ago by the Santa Fe. Recent tests showed that stresses produced in cars with conventional draft gears at 4 mph coupling speeds are not equalled in cars with the new underframe until impact speeds of 15 mph are reached. The road currently has 1,700 box cars with the 10-in. shock-control underframe.

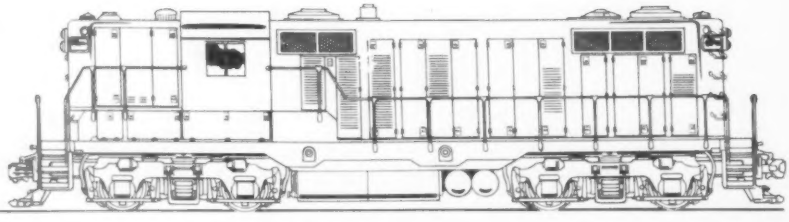
NEW 8000 HP GENERAL MOTORS (GP-20) LOCOMOTIVE FOR THE WESTERN PACIFIC



Recently, the Western Pacific celebrated its first half-century of service. Symbolizing the aggressive attitude of this "young" road is the delivery of the first new General Motors GP-20 locomotives. A four-unit, 8000 horsepower consist of the new units is pictured above on a Western Pacific freight run.

New 2000 hp GP-20 locomotive unit, one of six such units recently delivered to the Western Pacific Railroad, shown ready for shipment at Electro-Motive Division's La Grange, Ill. plant.

The GP-20 is nearly identical in size with past GP models. It measures 15′ high, 56′ long, coupler to coupler. Width is 10′.



Power is up, maintenance and fuel costs are down . . .

The GP-20:
a locomotive to revise all measurements of general purpose performance

The new GP-20 is a 2000 hp general purpose locomotive unit with four-wheel trucks. In appearance, it resembles past GP's but there the similarity ends. The increased capacity of its new prime mover, transmission and related systems has set new standards of performance.

For example:

Faster runs, more tonnage, greater versatility. The 2000 hp GP-20 has all the flexibility of predecessor GP's but with more capacity for heavy tonnage, high-speed freight service. In multi-unit consists, it will speed up present schedules, or handle more tonnage at established speeds. For many trains, the GP-20 will mean cost-saving unit elimination.

Lower fuel consumption. The new 567D-2 engine actually produces more power on a smaller diet than the famous "C" engine. The Electro-Motive designed Turbo-charger and new needle valve injector combine to reduce specific fuel consumption by as much as ten percent. The Turbo-charger is also responsible for maintaining rated engine power in higher altitude operation (up to 8000-foot altitude). With the GP-20, full-working power is maintained throughout a wide range of operating altitudes.

60% reduction in scheduled maintenance. More than thirty new maintenance reduction items are basic on the GP-20. Scheduled maintenance requirements have been lowered by 60 percent. In addition, the GP-20 contains material and design improvements in major components that measurably improve their durability and operating life.

Among the many improvements in the GP-20 is a new main generator with a 50 percent greater service life than previous generators, a new electro-magnetic control cabinet that completely eliminates scheduled maintenance, and a new high speed wheel slip control that protects traction motor components against damage from motor overspeed.

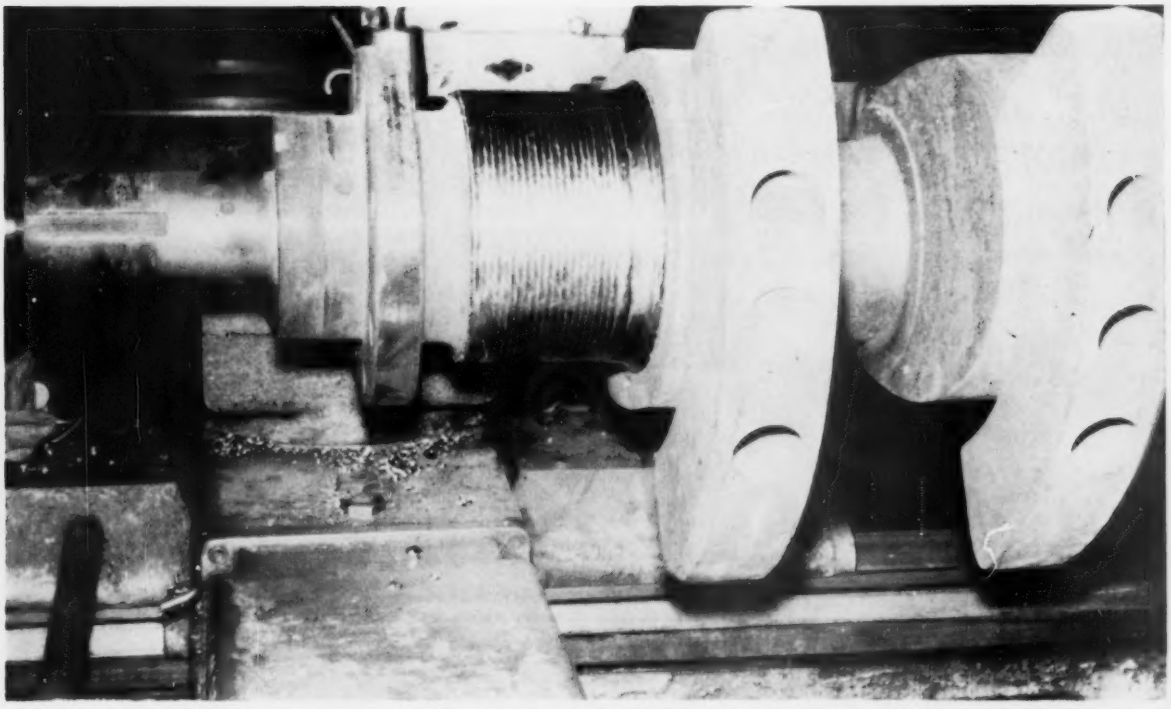
For specific details on the GP-20, contact your Electro-Motive representative.

ELECTRO-MOTIVE DIVISION
GENERAL MOTORS · LA GRANGE, ILLINOIS
Home of the Diesel Locomotive
In Canada: General Motors Diesel Limited, London, Ontario

GENERAL MOTORS LOCOMOTIVES

More power at less cost with General Motors great new line of locomotives—

1800 hp General Purpose GP-18 | 1800 hp Special Duty SD-18 | 2000 hp General Purpose GP-20 | 2400 hp Special Duty SD-24 | 1325 hp Road Switcher RS-1325



Worn crankshaft journal has been rebuilt with Unionmelt process. Completed shaft still must be stress relieved, machined, chrome plated, and ground.

Welding Salvages T&P Crankshafts

Results of reclamation process are successful; automatic welding has replaced manual method

Since late in 1957, the Texas & Pacific has been developing a method for reclaiming diesel locomotive crankshafts by welding. Substantial savings have been reported. The cost of the welding operation varies, but averages around $700 per shaft. All the welded shafts are chrome-plated to standard size, which results in a total reclamation cost of less than 43 per cent of the value of a new shaft.

Through January 1960, 26 shafts had been welded. The first 11 were welded by an experimental manual welding process and 15 by a newly developed automatic process. Of the first 11 manually processed shafts, four are still in service and have accumulated 702,625 miles. The oldest has been in service 19 months and operated 216,775 miles. None of the other seven hand-welded shafts failed in the welded bearing area, but broke or failed in unwelded areas. One of them had accumulated 279,140 miles in 13 months.

Of the 15 shafts welded by the automatic process, three have not yet been placed in service. One shaft failed after 13 months with 92,656 miles of service. The remaining 11 shafts have accumulated a total of 1,017,287 miles in 78 months' service. The first shaft welded by this process has been in service 14 months, accumulating 287,975 miles. The process is not used to repair broken shafts. Shafts which are welded are those that have cracks or burns, or are otherwise damaged on the connecting rod and main bearing journal surfaces. These are defects that could not be reclaimed by merely grinding and plating back to standard.

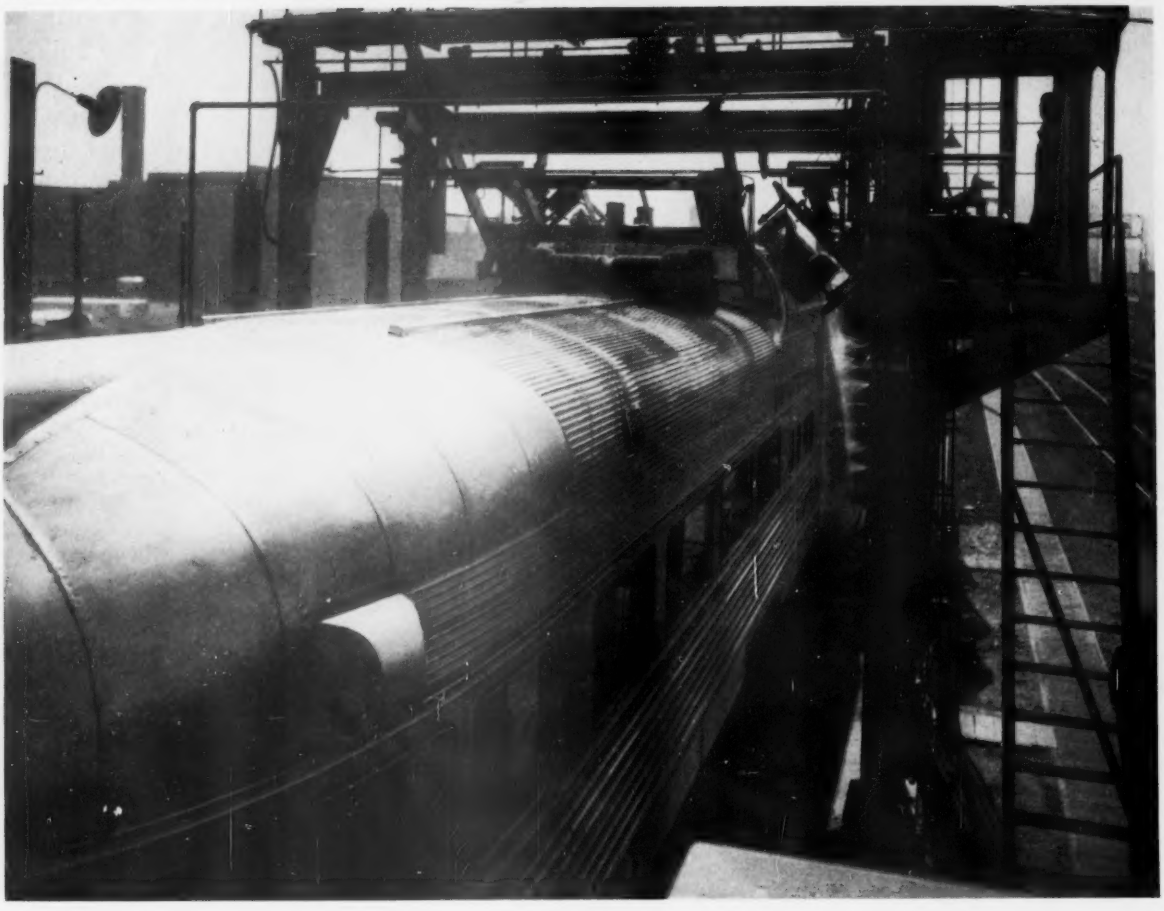
After shafts are reclaimed by welding, they are chrome plated. Chrome plating is not done by the railroad but by a plating company which also does the final balancing. After chrome plating, the surfaces are ground to final finish for original standard-size bearings.

It was necessary to develop jigs, tools and furnaces for this project. The damaged shafts are first visually examined and then tested with Magnaflux and Dy-Chek. If salvageable, the first step is separation of the two halves of the 16-cylinder shaft. Before the welding can be applied to bearing areas, shafts must be checked for cracks, alignment, and for undersize, worn or damaged bearing surfaces. Cracks must be ground out entirely, and oil holes are plugged with steel slugs. The locations of oil holes must be marked for future redrilling. Bearing surfaces to be welded must be machined ⅛ in. below original size to remove the effects of Tocco hardness treatment and to provide a true surface for a uniform deposit of new weld metal.

The shaft is then positioned in the welding jig and a preheat furnace enclosure is assembled around it. During preheating, the shaft must be ro-

(*Continued on page 35*)

Oakite adds more POWER to your MANPOWER



...mechanical scrubber washes cars streak-free at less cost, with least supervision

Keeping solution tanks supplied with Oakite 88 is about all the manpower involved in washing cars more efficiently. With this soil-loosening, safe Oakite solution that packs more cleaning power to the ounce, the mechanical scrubber does the job with amazing thoroughness. Oil, grease, and crater dust disappear.

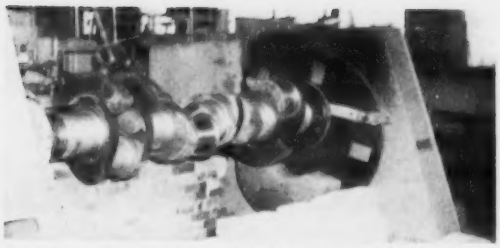
Here's how one terminal was convinced. Instead of their former material, they used a more dilute solution of Oakite 88. 125 cars were washed. Morning inspection revealed that each had dried down with *streak-free* sides and *sparkling* windows. And records showed that for each, the material consumed cost 75% less!

By boosting the cleaning power of your available manpower . . . by increasing cleaning efficiency of your maintenance equipment . . . Oakite gives you the important advantage: LOW-COST END RESULTS.

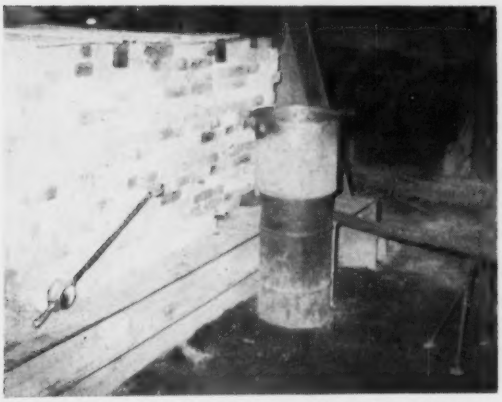
The Oakite man or Bulletin F-8055 gives the complete story. Send for either. Oakite Products, Inc., 46 Rector Street, New York 6, N. Y.

OAKITE

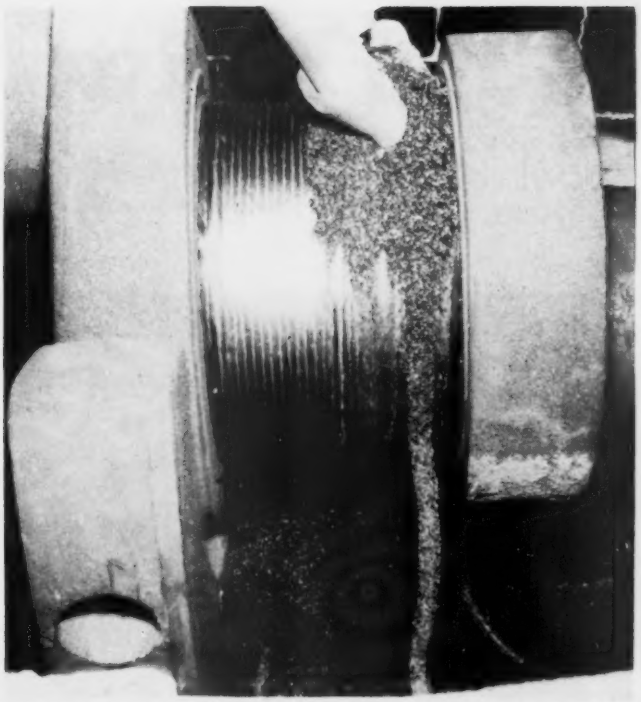
over 50 *Est. 1909* SCIENCE *years' leadership in industrial cleaning*



Oven for preheating the crankshaft to 500 deg F is assembled around the positioner in which the automatic welding is done.



Temperature must be controlled accurately during initial heating and shaft must not be allowed to cool during welding.



Automatic submerged-arc welding applies new hard-wearing surface to shaft. The 5/32-in. welding wire has composition compatible with shaft metal.

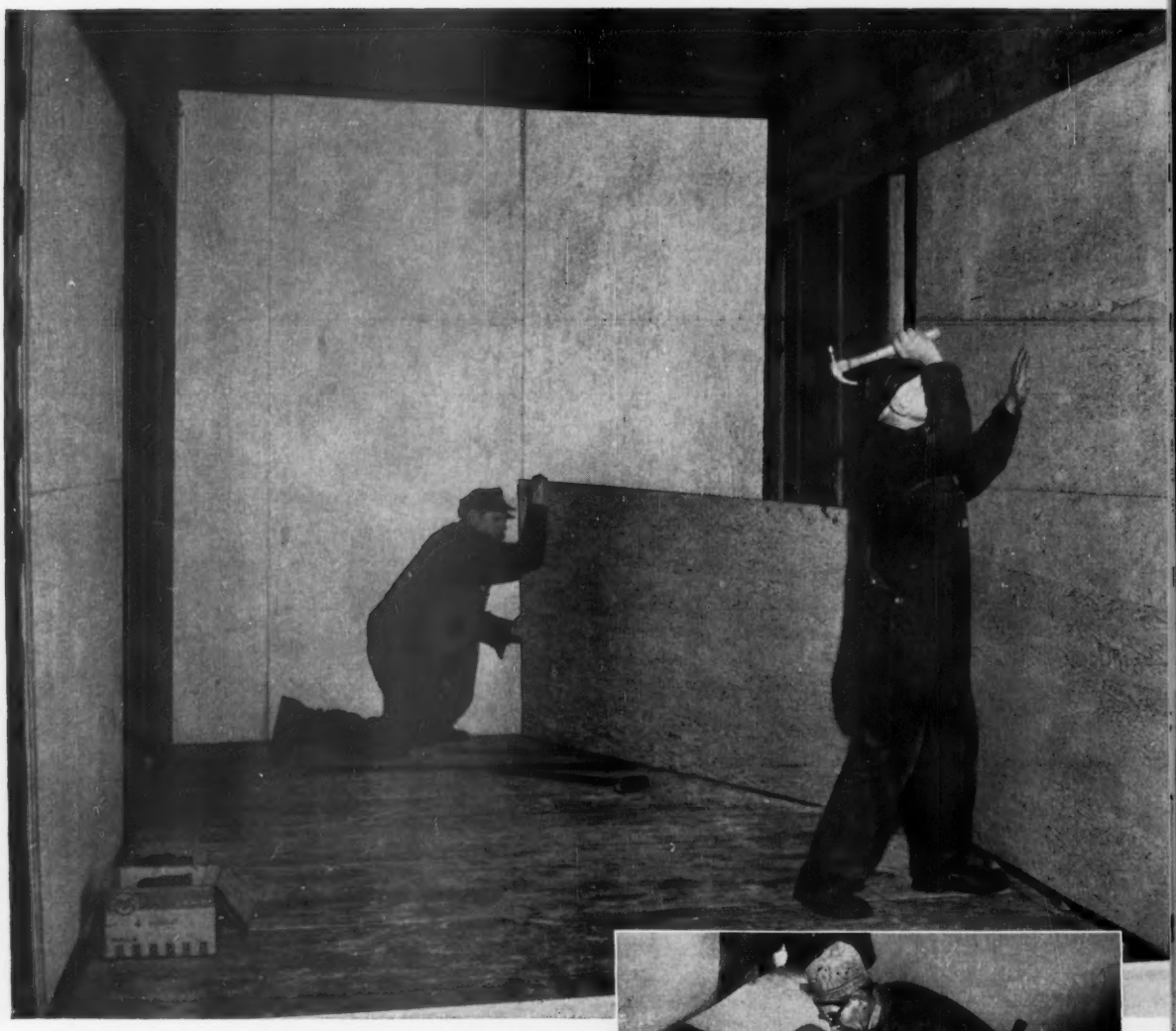
tated while heat is applied, gradually raising the temperature to 500 deg F. in eight hours. The 500-deg temperature must be maintained until all welding is completed.

All crank pins are welded initially. The shaft is then checked for the next operation and straightened, if necessary. All main bearing journals are welded, except for the center bearing. Center main bearing journal is checked for accuracy, and the shaft straightened again, if necessary. A small area is rough turned on the welded journals adjacent to the center main bearing. The center main bearing journal is welded. The shaft is checked and straightened, utilizing the turned areas previously mentioned. Welding current is 225 amps, voltage is 25 to 27 volts d-c, welding speed is 22 to 24 in. per min. No. 40 Linde UM wire and No. 50—8x48 Unionmelt composition are used. Analysis of the wire most nearly coincides with that of the parent metal. The shaft is rotated during welding to give the 22 to 24 in. per min. surface speed. The welding electrode arc action must be positioned slightly ahead of center on top of bearing area. Welded metal deposit is spiraled on to the surface continuously by automatic feed.

(*Continued on page 48*)

Uniform weld-metal deposit includes the lapping of progressive beads about 1/8 in. Welding is done in oven which maintains the shaft at 500 deg F. It is possible to stop welding for short intervals.

The Milwaukee Road for fast, low-cost



Lightweight and easy to handle, plywood cuts relining costs up to a third, provides durable, low-maintenance linings that stand up to hardest usage. Valuable ladings get maximum protection.

Old floors are covered with ¼" plywood for a smooth, snag-free surface. Precut sheets are stapled and bolted in place. Plywood goes on fast, keeps labor costs low while upgrading car quality.

uses Exterior plywood boxcar modernizing

THE MILWAUKEE ROAD has been getting savings up to 30% per car since its switch to plywood linings.

At Tacoma, Washington, Milwaukee's maintenance headquarters for the entire Northwest, plywood was first used experimentally for car relining eight years ago. Last year over 60 cars a week were reworked with fir plywood at the big Tacoma yard.

The method used varies according to each car's condition. If old lining is still fairly sound, it is left in place and ¼" Exterior fir plywood is stapled over it. Where the old lining is too badly damaged, worn portions are removed and ¾" plywood is applied directly to car studs. Quarter-inch Exterior plywood is also used to resurface worn floors.

The system is simple, fast and inexpensive. The railroad has found that relining cars with plywood cuts costs in some cases as much as 30%, depending on the condition of the car.

Economy is only part of the story. The Milwaukee uses plywood for linings because it is tough, rugged, and takes abuse without splitting. Most important, plywood-lined cars start paying their way at once. New business is easier to get because Milwaukee can offer its customers a first-class car. The smooth, splinter-free, clean interiors provide excellent protection for high-class, high-tariff ladings.

For more information about fir plywood—its uses, properties and advantages—write
DOUGLAS FIR PLYWOOD ASSOCIATION
TACOMA 2, WASHINGTON
—a non-profit industry organization devoted to research, promotion and quality control
Always specify by DFPA grade-trademarks

DFPA TESTED QUALITY

Precut panels of fir plywood are stapled over old lining, then bolted through exterior wall of car to discourage pilferage.

Exterior plywood is waterproof, comes in several sizes and grades, including overlaid panels with ultra-hard, smooth surfaces.

Solving Air-Compressor Problems

Development programs have been aimed at improving life of compressor components and drive coupling

TWO YEARS' SERVICE with an improved air-compressor coupling and a background of over ten years' work with water-cooled compressors indicate that high maintenance costs of these air system components can be controlled. Electro-Motive Division of General Motors has adopted both developments as standard.

EMD has rated the water-cooled compressor as the most significant advance in air-compressor design since the advent of the diesel locomotive. It has been basic equipment on E power since 1948; on GP's and F's since January 1957, and on SD's since 1959.

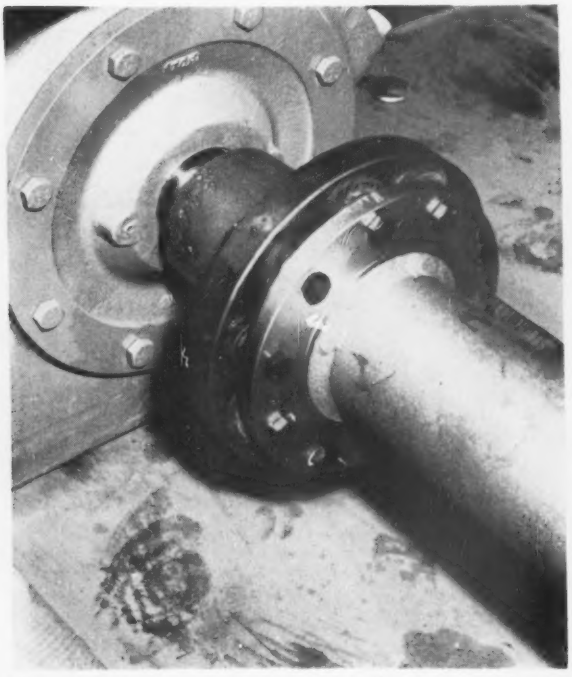
To keep pace with improvements in other components of the diesel locomotive, EMD initiated a program in late 1955 to develop an improved air-compressor coupling. The rubber coupling used today on GP, SD, E9, switcher, and export locomotives is a product of this program. The production coupling has been in service for over two years with no bushing failures.

Original three-cylinder, water-cooled compressors are now in their fourth year of service without repair or replacement of parts, as compared with what has developed on many roads to be an annual overhaul required with the air-cooled machines. One railroad has completed two years of service with water-cooled compressors and is in its third year without overhaul or repair.

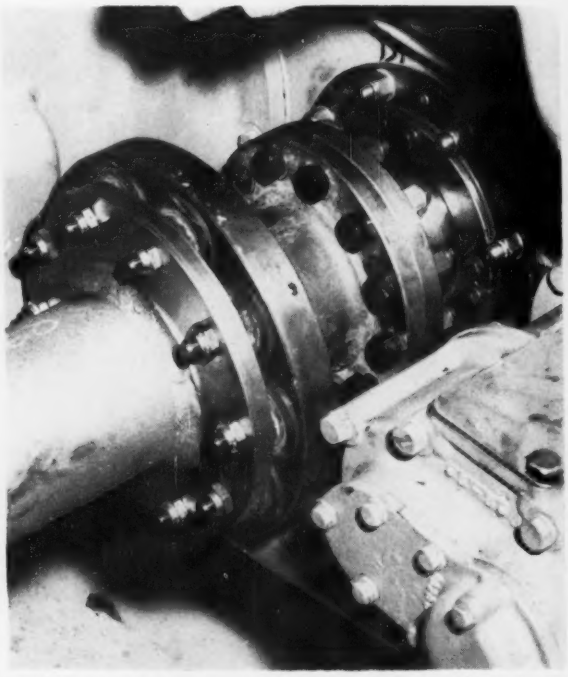
Service Experience

Annual inspection shows no accumulation of carbon or varnish deposit on valves. The low-pressure cylinders had no wear after three years of service and less than 0.001-in. wear in the high-pressure cylinder. Piston rings had only seated to use a third or half the width of their tapered face. Straight rings still had visible tool marks. Based on these and other field tests, EMD engineers say a six-year ring life is possible and compressor cylinders may have over ten years' life.

Two major problems have been experienced down through the years in operation of locomotive air compressors. One was lubrication of cylinder assemblies at all temperatures and speeds, and the other was contamination of discharge air by lube oil vapors and subsequent fouling of air brakes and air equipment. Extensive laboratory and field tests resulted in the application of three models of Gardner-Denver water-cooled compressors. The two-cylinder ABO is standard for E locomotives, the three-cylinder WBO for the GP and F units, and the six-cylinder WBG for SD's. Adoption of water-cooled cylinders and heads not only has reduced maintenance, but permitted modification of compressor piston rings and the lubrica-



Floating shaft facilitates coupling connection where compressor is up to 5 ft from engine. In most couplings, 10 rubber bushings are used.



Coupling assembly at engine end had to be designed within space restrictions imposed by drive location, allowing for oil strainer.

tion system so lubrication and oil carry-over problems are practically non-existent.

The water-cooled compressor is designed for continuous loading as contrasted with the air-cooled machine which can withstand only intermittent loading. This means that a lower discharge temperature and a more uniform lubricant temperature are maintained. The latest water-cooled compressors include the following design improvements:

- Direct-feed lubrication, eliminating transfer of oil from pump to the crankshaft through leather oil seals in the end bell with a direct connection through the oil-pump-drive eccentric strap;
- Removal of crankcase baffles, exposing the entire bottom of cylinders to oil thrown off the crankshaft;
- Redesign of pistons with all rings above the piston pin, allowing use of rings having a higher unit loading;
- Application of a spring to the top of the low-pressure-cylinder piston rings to maintain ring bearing against the groove during periods when the compressor is unloaded and no pressure exists;
- Modification of lube-oil-pressure regulator to maintain nearly constant pressure of 18 to 20 psi, meaning an increase in idling pressure and lubrication while reducing high-speed pressure and oil-control problems.

The piston pin extends the full length of the bushing. Multiple spiral slots to the ends of the bushing replace the single captive groove, permitting entry of oil from both ends. The cylinder head gasket thickness is reduced from 1/16 to 1/32 in. with new materials which assure more effective use of the compression chamber. Air-compressor bodies are shell molded to reduce captive volume at these points.

The oil-bath inlet filter protects the compressor from entry of abrasive material and eliminates expulsion of oil vapors from the compressor. A steel disc valve replaces the spring-loaded leather-faced disc or silicone rubber diaphragm formerly used in crankcase breathers. The breather discharge is piped to the compressor inlet filter. A float indicator permits instant check of oil-level whether or not the compressor is running. Overfilling the crankcase is prevented by moving the filler opening to the side plate of the crankcase at the oil level desired.

Tests in the field and at EMD indicate compressors with all these modifications will require little or no maintenance for three years or possibly six. Oil consumption will be reduced by as much as 90 per cent from that experienced on air-cooled machines in like service.

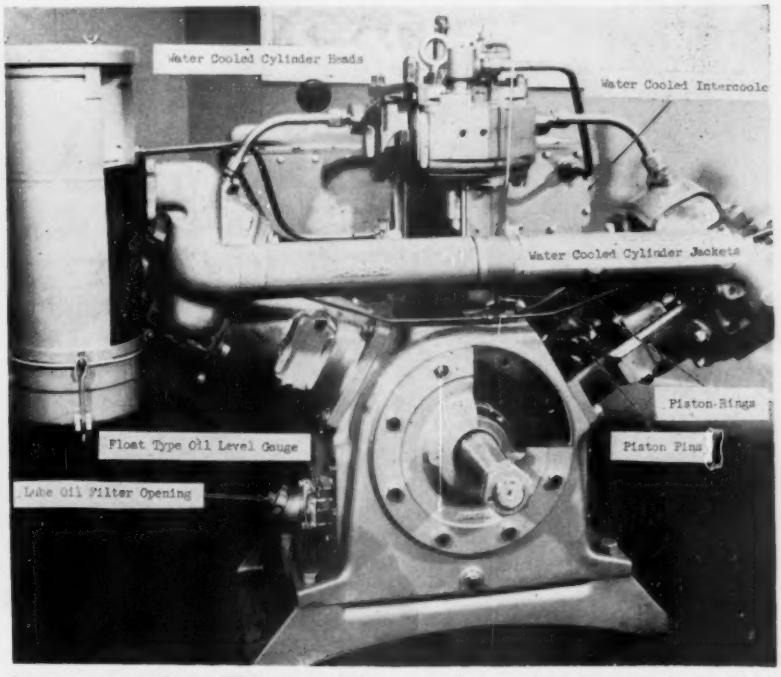
Coupling Design

Analysis of the coupling requirements for compressors shows the rubber coupling must have the following characteristics:

- Axial softness to permit thermal growth of the engine crankshaft. Any equipment attached to the crankshaft and supported on the locomotive underframe must absorb approximately 1/16 in. of crankshaft growth as the engine rises to operating temperature;
- Self-piloting and radial rigidness, with a floating shaft having a coupling on each end, to simplify alignment where the air compressor is 3 to 5 ft from the engine;
- Softness for angular misalignment so that unavoidable misalignment will not cause damaging forces to be applied to the compressor bearings;
- Torsional stiffness to keep vibrations of the compressor to a minimum and protect the coupling itself;
- Minimized maintenance requirements. No lubrication or adjustment should be required.
- A fail-safe arrangement so that coupling failure will not damage the

(*Continued on page 49*)

Present piston has all rings above pin (top). Former model had oil ring at base of skirt.



Improvements made in WBO three-cylinder water-cooled air compressors have been aimed at reducing maintenance costs by increasing life of important components.

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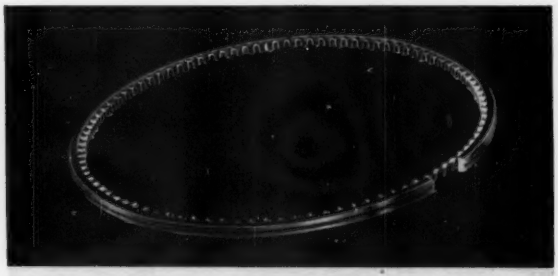
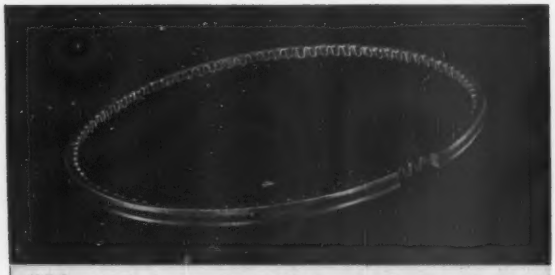


DD8—Provides maximum radial conformability and drainage under both scraping edges. Is somewhat lower in cost than the DO8 because of one-piece instead of two-piece construction of cast-iron section.



HO8—Maximum conformability and adequate drainage, with continuous channel, two scraping edges and wide central drainage slots for effective oil control. First cost is less than either DO8 or DD8.

BS8—This conformable ring combines compression and oil control functions. Backed by the "Equalizer," the solid single-piece cast-iron section has a narrow scraping edge and is especially effective in controlling blow-down and oil consumption in 2-cycle engines.

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ELECTRICAL SECTION

Transistorized Excitation Controls

Growing experience with diesel-electric locomotives is showing the excitation system can play an important role in improving life and performance of major locomotive components. In the past, conventional current and voltage limits have protected primarily generators and traction equipment.

Engine horsepower at a given throttle notch has been limited by the combined operation of fuel limit and load control. Railroad experience has indicated that variations in ambient conditions and fuel quality can cause engine horsepower at a given fuel limit to increase to a point which may cause excessive engine maintenance. As the trend to higher horsepower continues, the need for a more precise horsepower demand limit becomes increasingly evident. As the horsepower of locomotive units increases, detection of wheel slip assumes greater importance. This is particularly true in the higher locomotive speed ranges where most slip detection systems often do not give adequate protection.

The need for performing all the above functions prompted development of a new excitation system. A new amplifying and control mechanism combining magnetics and semiconductors has been evolved.

Semi-conductors were considered as control elements because:

- Control requirements are low energy and compatible with economically derived signals, eliminating need of interstage amplifiers;
- Long life and reliable operation demanded by locomotive applications are satisfied.

A combination magnetic and transistorized amplifier was developed because the semi-conductor amplifier, or transistor, does not satisfy locomotive requirements for controlling sufficient power and allowing for a multitude of input signals, each electrically isolated from the others and from the locomotive control voltage source. Before widespread application could be made to locomotive excitation controls, the power handling capacity and the signal mixing ability of the basic transistor had to be enhanced.

The new power plant regulator has been applied to the Union Pacific 8,500-hp gas-turbine locomotives (RL&C, March 1959, p 44). On these locomotives it has already operated for more than 4,000,000 unit-miles. In addition, regulators of slightly different design have been undergoing field tests on New York Central and Erie diesels. The five Alco DI-640 2,400-hp demonstrator road switchers (RL&C, February 1960, page 17) have the MG-8 power-plant regulator. Controls on the Erie and Alco DL-640 units incorporate the adhesion loss detector.

General Electric believes that this system will be a substantial contribution to the field of locomotive control systems, giving improved performance and reliability. Among the improvements are:

- Interchangeability of components. All components are mounted on equipment boards. During factory test, each board is compared and adjusted with a standard. This gives complete interchangeability. Any board can be replaced with a board from any other panel of the same model.
- Long life. With the exception of electrolytic capacitors, none of the system components deteriorates measurably with time or service. Past experience indicates that capacitors can be expected to last for at least 10 years.
- Reduced diesel engine maintenance. Although savings on engine maintenance due to the horsepower limit are not now available, it is reasonable to expect greater engine life and reduced maintenance if the engine is held to its rating.
- Adhesion loss control. Data from various wheel slip systems indicate locomotive wheels slip to excessive speeds more often than previously supposed. Tests show that the adhesion loss control feature of this excitation system not only limits wheel slip to 5 to 6 mph above rail speed, but also enables the locomotive to work at maximum possible adhesion under any conditions. This adhesion loss control will play an important role in increasing the tonnage on ruling grades and in moving freight at the maximum possible speed on slippery track. It also eliminates damage to traction equipment, wheels and rail caused by uncontrolled wheel slips.

The mechanism for control can be compared to operating switch S in the circuit in Fig. 1. Assume the switch-

Based on a paper prepared by T. T. Means and W. B. Zelina, Locomotive and Car Equipment Department, General Electric Co., for the recent winter meeting of the AIEE Committee on Land Transportation at New York.

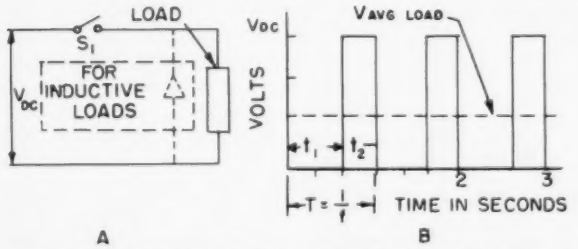

Fig. 1—Basic switching circuit (A) can be utilized to produce average voltage shown in time-voltage diagram (B) by altering the timing cycle. It is possible to regulate average at any value between zero and full applied voltage.

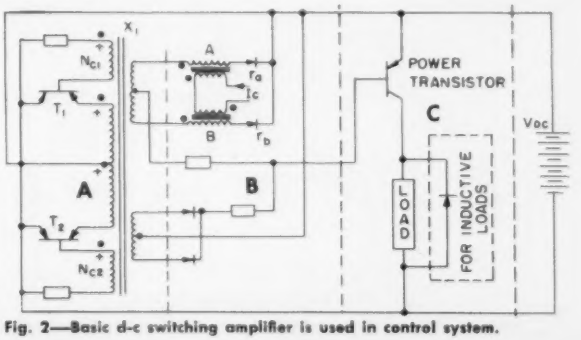

Fig. 2—Basic d-c switching amplifier is used in control system.

ing frequency to be 1 cps. If, during each cycle, S closes when t is 2/3 sec and opens at the end of the cycle, the average load voltage would be 1/3 V. The average load voltage is tv/T.

This equation shows that the average load voltage may be varied from zero to V as t is varied from zero to T. If the load is resistive and S is an ideal switch, the efficiency of this control would be 100 per cent; the power dissipated by S would be zero. For applications involving inductive loads, a commutating rectifier shunted around the load would make the load appear resistive by providing a return path for the energy stored in the magnetic field.

This control mechanism is implemented by using magnetic and semiconductor devices. Referring to Fig. 2, the switch S is replaced by a power transistor shown in Section C; timing of the switching action is accomplished by the pulse-width modulator (self-saturating magnetic amplifier) shown in Section B; while a square-wave voltage is supplied from the oscillator shown in Section A.

Starting with the oscillator, the operation of the amplifier is as follows: Transistors act as switches which alternately are turned on and off by the voltage induced in the control windings. These switches alternately connect the d-c supply voltage first in a direction to positively magnetize the transformer core and then, after saturation is reached, in a direction to negatively magnetize the core.

The pulse-width modulator, Section B, uses a self-saturating magnetic amplifier to modulate the width of the square-wave a-c input. The width of the d-c output pulse will be controlled by the net ampere turns applied to the signal windings for the square-wave a-c supply. The square-wave oscillator and the d-c self-saturating magnetic amplifier provide a width-modulated voltage pulse supply. The pulse width is set by the net control ampere-turns on the self-saturating magnetic amplifier. This pulse width is controllable between zero and 100 per cent, corresponding, respectively, to the totally turned-off and turned-on states of the self-saturating magnetic amplifier.

Referring to Section C, the self-saturating magnetic amplifier width-modulated pulse is used to turn the transistor on and off. An additional d-c voltage supplied by the oscillator is used as a turn-off bias on the power transistor. This provides a path external to the transistor for the flow of the exciting current of the self-saturating magnetic amplifier. Additional thermal stability is provided by back biasing the power transistor in the absence of turn-on pulses. This back biasing supply is also effective in increasing the off switching speed of the power transistor by sweeping out carriers in transit at the instant the turn-on pulse is terminated.

Because the magnetic amplifier (pulse-width modulator) controls the output power, any number of electrically isolated input signals can be accommodated. The change of control energy to control the pulse width between 0 and 100 per cent is in the order of a milliwatt. Hence, a transducer of this low-energy level can be used for the control of any locomotive function.

Motoring Control

When the locomotive power circuits are arranged for motoring, the excitation control limits the generator current and voltage, and includes an electrical horsepower demand limit on the diesel engine with an adhesion limit which automatically adjusts tractive effort if it exceeds the adhesion limit. A block diagram arrangement of the excitation control is shown in Fig. 3. The 75-volt d-c voltage is fed into the oscillator and power switch. The oscillator produces a 300 cps square-wave alternating voltage used for the pulse-width modulator supply and as an alternating source for the voltage and current measuring reactors. The 300 cps alternating voltage is converted to 600 cps width-modulated control pulses by the pulse-width modulator. The control pulse is used to drive the power switch (power transistor) to control the exciter field current. The exciter, in turn, supplies the field of the traction generator.

Traction generator current is measured by the current measuring reactor, CMR. Its output is compared with a reference controlled by diesel engine speed in the reference mixer RM. As the current exceeds the reference, the developed error is fed to the PWM to reduce the width of the control pulse, thereby controlling generator current. A function generating circuit produces a current that is a function of generator voltage. This current is fed to CMR in a direction to add ampere-turns to those representing traction generator amperes. Since, in effect, the system regulates the output of the CMR constant (except for the small regulating error) the traction generator amperes will decrease in proportion to the current introduced by the function generator. In this manner, the horsepower demand on the diesel engine is held to a preset value.

As the locomotive accelerates and the generator voltage increases, the output of the voltage measuring reactor VMR increases in direct proportion. The reference mixer (RM) has the ability to recognize the larger of the two inputs and compare only the larger to the reference. As VMR out-

(*Continued on page 44*)

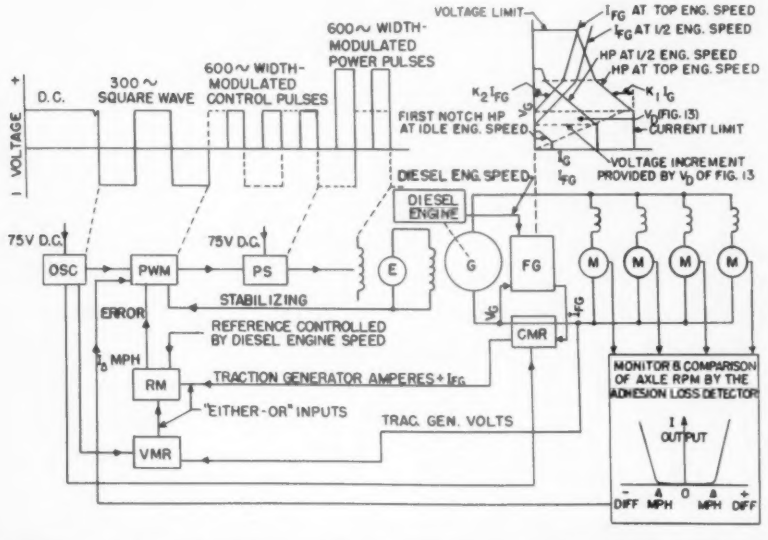

Fig. 3—Block diagram shows arrangement of the new motoring excitation control system.

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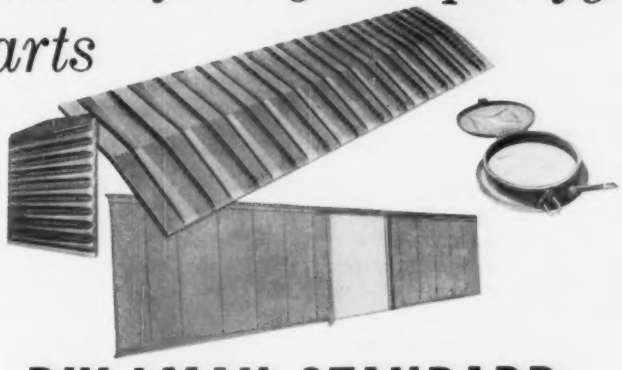

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put exceeds that of the CMR, it will take over control and the system will regulate constant generator voltage. The three limits — current, horsepower, and voltage—are set by engine speed to produce the required generator characteristics.

If the adhesion limit for any operating condition is exceeded, an error signal is generated proportional to the slip or slide differential by the adhesion loss detector. This error is fed to the PWM to further reduce excitation to control the adhesion loss. This allows operation up to the maximum adhesion set by track conditions.

For rheostatic braking, variable limits are placed on both the field and the armature currents of the traction motors to provide smooth control and prevent damage to the traction motors and braking grids. Limits are set by the engineman's braking handle position unless the braking effort exceeds the adhesion limit. Should this occur, the braking currents are automatically reduced to prevent wheel slides.

From the Diesel Maintainer's Note Book

Two Birds with One Stone

By Gordon Taylor

Engineman White was operating a three-unit F-7 locomotive in freight service. It was last Thanksgiving Day, and the train was bound for the home terminal. Everyone aboard was thinking of the turkey dinner that would be waiting. Things were working fine, and it looked like an uneventful trip until they reached Eastville, a point about 20 miles from home. Then, as the engines on all units slowed down and stopped, all thoughts of home and Thanksgiving were brushed aside.

"Well," said White as the train rolled to a stop, "if we can shoot diesel trouble like we do quail, dinner time may still find us at home for turkey. Let's check ground relays."

The ground relays had not tripped. Next, a check was made of all fuses in the control system. The 15-amp fuse that feeds current to the fuel pump switch at the engineman's control station in the cab of the lead unit had blown. This fuse is needed to energize the FP wire that runs through all units. It is the master fuse that supplies control circuits for all fuel pumps in a multiple-unit locomotive. The FP wire also energizes all ER (engine run) relays to control engine speeds on each of the units.

White immediately recognized the importance of this fuse and replaced it. When all of the engines were started again, the fuse promptly blew. There was no apparent reason and certainly no guarantee that trouble was confined to the lead unit.

White said to his conductor, who had joined him by this time, "If I can only talk to Doc Watts, the electrical foreman at the diesel house at Centerville, he might help us get moving.

"I'll go over to the tower," White continued, "and call Centerville so we can tell Doc what has happened."

Although it was Thanksgiving, Doc was in his office. White told him what had happened.

"When the FP wire is de-energized by a blown fuse," Doc said as he contemplated the possibilities, "the cause may be grounded circuits on two different units rather than a short circuit on one unit.

"To isolate and localize the trouble, try this procedure: Remove the control jumpers between all units. Then, with a good fuse in the front cab, start up the engine on the lead unit to see if its fuel pump circuit is OK. If the lead unit checks out, then replace the jumper cable between the first and second units to see if the second unit works. If it does, then put the jumper cable up between the second and third units and start the third engine. If the fuse blows, remove the jumper cable from the third unit. Replace the blown fuse and see if you can get on in here with two units. You'll be late, but still get here in time for turkey."

The engineman returned to the locomotive and followed Watt's advice. The lead unit performed properly. When the second unit was started, the fuse in the lead unit did not blow. However, when the third unit engine was started, the 15-amp fuse on the lead unit blew again.

"That third unit must be the villain," said White. "I'll take down its jumper cable and we'll go on in with two units."

After they had pulled in, late and hungry, Engineman White turned to his conductor and asked: "Do you know what I am most thankful for today?" Answering his own question, he went on: "It is that we have Doc Watts to call on in time of trouble—even on Thanksgiving Day!

"Right now it looks like there was a short circuit on the third unit. But if I understand Doc's comment, then the third unit may have provided only half of the short circuit that caused the fuse to blow. Tomorrow, I think I'll call on Doc and have him tell me just where he finally located the trouble. The more we understand about these locomotives, the better able we will be to get them moving in time of trouble."

When the engineman called the next day, Doc explained: "This case turned out to be about as I had sus-

(*Continued on page 46*)

M-F lading strap anchors arouse interest at suppliers' show.

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(*Continued from page 44*)

pected. As you know, blown fuses are caused by short circuits which allow a current flow to take short cuts to complete its trip back to the generator or battery from which it started. By dodging its usual working path, the current has nothing to restrain it. Its strength increases to the point where it blows the fuse.

"A short circuit does not have to be localized in one unit. A wire leading from the positive side of the battery (say, on the lead unit) may be making contact with the locomotive frame or some metal part that touches the frame. That condition is called a ground. It will do no harm, for the current still has to follow its regular working path back to the battery. But should a wire connected with the negative terminal of the battery become grounded, a short circuit is established between the grounded positive wire and the grounded negative wire. This will cause the fuse to blow.

"In this case, the positive side of the fuel pump control circuit, the FP wire, was grounded in the lead unit and the negative wire, N4, was grounded in the third unit. The grounded connection in the third unit did not have to be in the fuel pump circuit. A ground anywhere in the negative wire would provide the short circuit that had been started by the grounded FP wire on the lead unit. It did require that the jumper control cable be connected on the third unit to complete the short circuit path. When we located and cleared the ground connections on these two units, we could call this case closed.

"I will say that grounded circuits on a diesel locomotive are a most frequent cause of control circuit failures. These control grounds are sneaky things. They give no sign of their existence, but wait quietly for a ground to appear on the opposite side of the circuit. When that happens, current suddenly dashes across the short circuit path to blow fuses or open circuit breakers.

"Grounds in the high-voltage power circuits of a locomotive cannot hide like the grounds in the low-voltage control circuits. The ground relay is the watch dog that prevents damage that could be caused by grounded power circuits. One terminal of the ground relay is connected to the terminal of the shunt field contactor. The other terminal grounds to the body.

"In case of a ground in the high-voltage wiring system, the current will travel through the car body frame and complete the circuit to energize the ground relay. When tripped, the relay contacts open to de-energize the ER relay and the shunt and battery field contactor coils. The engine speed will drop to idle and the field contactors will open. The protective ground relay will trip in case of a ground in the low-voltage system *only* when the engine is being started, because that is the only time the high- and low-voltage systems are connected.

"The only trouble with the ground relay is that it acts only when the grounded condition will pass enough current to trip the relay. That is fine protection for heavy metallic grounds, but many times the grounds are caused by moist or dirty insulation. The moisture grounds set up creepage or current leakage paths that finally pass enough current to ground trip the relay. What is needed is something to enable enginemen and maintainers to see when moisture grounds are developing so remedial action may be taken before the ground reaches a stage where it causes delays.

"An interesting account of such a device, a milliameter connected in series with the ground relay operating coil, used by the Chicago & North Western is in the September 1959 issue of Railway Locomotives and Cars, page 83. It is recommended reading for all who wish to maintain high insulation values in the high-voltage systems of diesel locomotives."

Remember Doc Watts' old maxim 'A man is as old as his arteries; a motor is as old as its insulation.' To maintain insulation value high, keep circuits clean and keep them dry. You will then be blessed with motors that keep young and stay on the job.

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Salvaging Crankshafts

(*Continued from page 35*)

Preceeding weld beads, or passes, must be overlapped ⅛ in. to 3/16 in. over entire width of the bearing area. If more metal is required than is deposited in a single pass over the area, more passes can be made without interrupting the welding action. Close attention must be paid during welding to keep the arc covered with flux and to remove fused composition from weld beads as the welding progresses. If, for some reason, defects, such as pin holes, appear in weld deposits, the welding action must be stopped and defects ground out before continuing. The T&P has found that this is imperative.

When the weld deposit approaches the fillet at either end of the bearing area, caution must be exercised in making adjustments in the electrode angle to obtain good bead contour. Welding action may be interrupted momentarily, if necessary, to make electrode nozzle adjustments at each fillet area.

After welding of all areas is completed, the heating furnace must be cooled with the shaft rotating in it until room temperature is reached. The shaft must be checked again for distortion, and straightened while still in the jig fixture. All welded areas are then rough machined to within 1/64 in. oversize. Oil hole slugs are drilled out.

For final heat treatment, the shaft is placed in a heat-treat furnace and the temperature brought up to 1,150 to 1,200 deg F in a 16-hr period. It is held at this temperature for 8 hrs. The furnace and shaft are then allowed to cool to room temperature. This will usually require about 72 hr, depending upon the type of furnace used. This final heat treatment removes residual stresses from the crankshaft.

Crankshaft centers are then checked and center face ground. The two halves of the 16-cylinder shafts are reassembled, using the fitted bolts, and the oil passages are rodded. A shaft is now ready for straightening, machining, and grinding. The welded areas are finish ground to .020 undersize to allow extra surface thickness for chrome plating.

While the T&P is convinced that the operation outlined is successful, it expects to improve results by continued development work.

Compressor Problems

(*Continued from page 39*)

compressor or adjacent equipment.

• An outside diameter not exceeding 11½ in. because of the location of the drive off the engine crankshaft and the proximity of engine lube-oil strainer box.

The coupling consists of ten rubber bushings (five on some smaller models) pressed into undersize, specially contoured holes in a steel plate or cast-iron hub. Each bushing is bonded to a steel core which, at assembly, is piloted and bolted to a mating flange. Torque is transmitted through the coupling by radial compression of the rubber bushings between the steel core and the hub. Radial pre-compression of the rubber prevents the unloaded side of the bushing from losing contact with the sides of the hole.

By using two couplings with a shaft between, parallel misalignment is converted to angular misalignment at each coupling. The couplings absorb angular misalignment by axial movement of the steel core with respect to the hub, putting the rubber in shear.

The bushings are placed on an 8½-in. diameter circle, and the outside diameter of the hub is 11¼ in. This makes the coupling acceptable both for current locomotives and most of the EMD locomotives now in service. The rubber coupling is assembled and installed at the factory. No further adjustment or maintenance is required.

During development, 25 locomotives were equipped with couplings having bushings with softer and less wear-resistant rubber. After over three years of operation, only five units had had bushings replaced because of wear. Rubber dust was found in the vicinity of the bushing three to six weeks before the bushings deteriorated to the point where they had to be replaced. This gave ample warning. The couplings never failed so that the compressor became inoperative. In those failures that were allowed to progress, the compressor was still driven by the steel cores engaging the holes in the hub.

Assuming no external damage, EMD engineers say the coupling will operate satisfactorily with no attention for the life of the rubber bushings. They feel that the current coupling, on the basis of improved qualities of the present bushing, will have a life in excess of five years.

(*Continued from page 7*)

New Shop Facilities

Delaware & Hudson.—A new D&H freight-car paint shop will be constructed at Oneonta, N.Y., at an approximate cost of $250,000. It is scheduled for completion by September 1.

Milwaukee.—New car-repair facilities will be built at Bensenville Yard near Chicago at a cost of $910,000. The layout will include metal shop, blacksmith shop, welfare building, storage buildings, and about 20,000 ft of track. The shop will have a capacity to repair about 120 cars daily.

Pennsylvania.—Consolidation and modernization of equipment maintenance facilities at the Pennsylvania's Altoona Works, Altoona, Pa., have been made the object of a study just undertaken by Robert T. Phillips & Associates, engineering consultants. Traditionally, Altoona Works has been the heavy repair shop for the Pennsylvania.

Transfer of freight-car work to the Samuel Rea shop in nearby Hollidaysburg, Pa., and the end of steam locomotive repairs have meant that large areas and numerous buildings of the Altoona Works are now only partially used or are vacant. "Physical rearrangement may take several years," according to J. L. Parker, newly appointed works manager (RL&C, February, p 50). "More property will be made available for industrial development," he explained.

It is planned to consolidate related operations, such as diesel maintenance work. A modern, mechanized freight-car air-brake shop is now being established at Altoona to do the work done at a number of points on the system. A study is being made to determine the feasibility of establishing a mechanized wheel shop to perform all freight-car-wheel work for the railroad.

Simmons-Boardman Acquires Railway Educational Bureau

The Railway Educational Bureau, Omaha, Nebr., a 45-year-old organization engaged in apprenticeship training programs for railroads, has been acquired by the Simmons-Boardman Publishing Corp., New York. B. Charles Walters, supervisor of apprentice training, Rock Island, Moline, has been appointed director of the Bureau. He assumed duties at the Omaha headquarters March 1.

The Bureau publishes training materials, including textbooks, for use in apprenticeship programs in the mechanical, signaling and other railroad departments. Classroom courses range up to four years in length, and supplement regular on-the-job training. At present, the organization has training contracts with 15 Class I railroads.

Simmons-Boardman publishes a number of business papers, including Railway Age, and Railway Locomotives & Cars. The company also maintains an extensive book publishing operation. Current titles include books about railroad operations, economics and regulation, as well as specialized engineering works about locomotives, freight and passenger cars, and track and roadway.

"This acquisition of the Railway Educational Bureau will strengthen Simmons-Boardman's ability to serve the railroad industry by supplementing the numerous publications we now have," A. J. McGinnis, Simmons-Boardman president, said. He noted that business papers, themselves, provide an important educational service at the management and engineering levels, while the Bureau will expand this into all levels of railroad personnel.

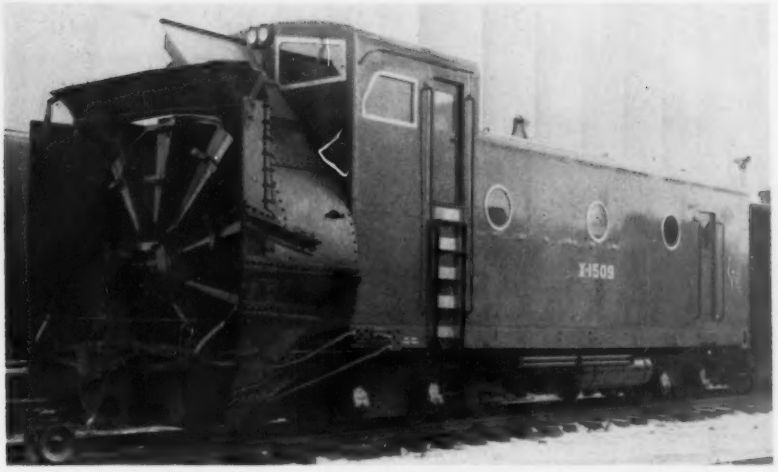
Courses presently offered by the Bureau cover all phases of the locomotive and car department, the signaling department and supervisory training. Immediate plans call for the addition of courses covering maintenance of way and engineering, and purchases and stores.

The Bureau was founded in 1914 by Dexter C. Buell, who died in Omaha Jan. 21 at the age of 78.

GN Rotary Goes Electric

The Great Northern's first electrically powered rotary, for heavy snow duty at Whitefish, Mont., was rebuilt at the company's Dale Street shops, St. Paul, Minn. The 92-ton X1509 is the most powerful ever to operate on the railroad. It is equipped with four series traction motors, taken from the GN's largest single-cab electric locomotive in the world, retired in 1956 when the Cascades electrified operations ended.

General Electric's automatic control "package" provides built-in safety devices. A differential exciter prevents over-speed of the plow rotor when the load is suddenly dropped, as would be the case when coming out of a cut filled with snow into the open.



Standard series traction motors are considered more desirable than specially manufactured shunt motors which would provide inherent control of the maximum speed regardless of the load. Control of the plow rotor speed is through control of the speed of the engine driving the generator which furnishes power to the plow driving motors. The rotor speed may also be controlled to some extent in the plowing operation by controlling the speed of the pusher locomotive. There is a maximum speed for no-load for the traction motors which will not be exceeded while the system is operating as intended. Two overload relays detect excessive driving motor current and automatically correct for same by dropping pusher and rotor power.

The X1509 is equipped with Timken bearings, and has a babbitt bearing in the rotary nose. The 11 ft. 6 in. rotor has ten double-edged blades studded with ice picks. Controlled maximum rotor speed is 150 rpm, average working speed 120 rpm. Any of the four motors may be removed by raising the roof hatch or opening the side doors. Walkways over the machinery can be disassembled for access to the motors. Two men operate the unit. Controls for both the rotary and the diesel locomotive pusher unit are in the rotary cab.

Open-Top Loading Rules In Loose-Leaf Form

A revised edition of the AAR Mechanical Division open-top loading rules, consisting of six sections in loose-leaf form printed on letter-size sheets, became effective February 1. In most cases, the drawing and specification for each individual loading method is shown on a single page.

The Division suggests railroads supply their mechanical department officers, supervisors, foremen, and car inspectors with the complete publication. Shippers should be notified of this new arrangement. They may obtain only those sections covering their commodities. Purchase must include the binder cover and Section 1 containing general rules.

The six sections of the new manual are (1) General Rules Governing the Loading of Commodities on Open-Top Cars; (2) Rules Governing the Loading of Steel Products, Including Pipe, on Open-Top Cars; (3) Rules Governing the Loading of Road Grading, Road Making, and Farm Equipment Machinery on Open-Top Cars; (4) Rules Governing the Loading of Miscellaneous Commodities, Including Machinery, on Open-Top Cars; (5) Rules Governing the Loading of Forest Products on Open-Top Cars; (6) Rules Governing the Loading of Department of Defense Materiel on Open-Top Cars.

Personal Mention

Atlantic Coast Line.—*Jacksonville, Fla.:* Headquarters of J. W. HAWTHORNE, chief mechanical officer transferred to Jacksonville from Wilmington, N. C.

Burlington.—*Chicago:* L. E. QUIRIN appointed general superintendent of motive power and equipment. *Aurora, Ill.:* L. G. HARVILLE appointed superintendent of shops, succeeding Mr. Quirin. *Hannibal, Mo.:* H. H. NIEMEYER, appointed master mechanic, Hannibal division, succeeding Mr. Harville. Mr. Niemeyer formerly general boiler inspector at Chicago. *Lincoln, Neb.:* P. E. POINDEXTER appointed master mechanic, Lincoln, Omaha and Wymore divisions, succeeding C. E. BLOOM, retired. Mr. Poindexter formerly assistant district master mechanic, locomotive and car department, Chicago, Aurora and La Cross divisions.

Canadian National—*Toronto, Ont.:* WILLIAM D. PIGGOT appointed regional work study officer. G. L. GALLOWAY appointed assistant general superintendent of motive power, succeeding Mr. Piggott. R. M. VEENIS appointed superintendent motive power and car equipment, succeeding Mr. Galloway. *Montreal, Que.:* W. J. NOTLEY appointed superintendent of motive power and car equipment, succeeding Mr. Veenis. *Stratford, Ont.:* WALTER WYNNE appointed superintendent Stratford shops, succeeding Mr. Notley. Mr. Wynne previously assistant superintendent work equipment, Toronto.

Central of Georgia.—*Columbus, Ga.:* D. A. GILLELAND appointed master mechanic. Formerly assistant general foreman at Cedartown, Ga.

Central of New Jersey.—*Jersey City, N. J.:* PETER R. BROADLEY has returned to Jersey Central as assistant to vice-president and general manager. Mr. Broadley was mechanical engineer in 1947 when given a leave-of-absence to work with the Locomotive Development Committee, Bituminous Coal Research, Inc., in the development of a coal-burning turbine for locomotive use. Mr. Broadley was director of research of the committee, which has now been disbanded.

Donora Southern.—*Donora, Pa.:* ROBERT A. MCWILLIAMS appointed superintendent motive power and equipment, succeeding IVAN S. GIBB, now superintendent motive power of the Lake Terminal.

Duluth, South Shore & Atlantic.—*Marquette, Mich.:* JOHN F. CARLSON appointed road foreman.

Florida East Coast.—*St. Augustine, Fla.:* W. A. BAKER appointed chief mechanical officer. Formerly assistant chief mechanical officer of the New Haven.

Lake Terminal.—*Lorain, Ohio:* IVAN S. GIBB appointed superintendent motive power. Formerly superintendent motive power and equipment, Donora Southern, Donora, Pa.

Long Island.—*Richmond Hill, N. Y.:* ANTHONY SCHETTONE, JR., appointed diesel supervisor. CHARLES P. SOFFEL, chief diesel

inspector, appointed general locomotive foreman, succeeding Mr. Schettone.

Louisville & Nashville. — *Louisville, Ky.:* ROBERT L. MORRIS, electrical supervisor, appointed electrical engineer.

New York Central.—*Toledo, Ohio:* ERNEST A. ANESI appointed master mechanic. Formerly assistant master mechanic, Harmon, N. Y.

Norfolk & Western. — *Roanoke, Va.:* CARL C. GODSEY appointed assistant foreman, locomotive department, Shaffers Crossing, succeeding C. P. FORREST (retired), whose title was machine shop foreman. RAYMOND L. GILMORE appointed assistant foreman, locomotive department, succeeding Mr. Godsey, whose title was assistant foreman. HUGH E. CALDWELL appointed gang foreman electrical, succeeding Mr. Gilmore. W. B. JOHNSON, shop inspector, appointed electrical inspector, succeeding Mr. Caldwell. RICHARD S. BROWN, gang leader, appointed gang foreman electrical. *Portsmouth, Ohio:* CARL C. RUTH appointed foreman electrician, succeeding C. M. STEVENS, retired. FLETCHER B. MCDANIEL appointed assistant foreman electrician, succeeding Mr. Ruth. WILLIAM J. CRAWFORD appointed gang foreman (electrical), succeeding Mr. McDaniel. *Williamson, W. Va.:* F. WILSON BALTHIS appointed foreman electrician, succeeding CLARENCE F. CORMELL, retired. Formerly gang foreman, electrical, at Roanoke shops.

Reading.—*Reading, Pa.:* FREDERICK J. MAY appointed superintendent car department, succeeding HARRY F. LYONS, retired. JOSEPH E. DATTNER, general foreman, freight-car shop, appointed assistant superintendent, car department, succeeding Mr. May. FRANKLIN L. GROH appointed superintendent, Reading car shop. WILLIAM C. SPANG, general foreman, passenger car shop, appointed assistant superintendent, Reading car shop, succeeding Mr. Groh.

Santa Fe.—*Chicago:* D. L. QUANEY appointed master mechanic. K. A. WOLFE appointed general foreman, succeeding G. F. Sgitcovich. Mr. Wolfe formerly assistant night enginehouse foreman at Barstow, Cal. *Los Angeles, Cal.:* E. B. WOOD appointed master mechanic, succeeding Mr. Quaney. *Winslow, Ariz.:* J. F. KANIVE appointed master mechanic, succeeding Mr. Wood. *San Bernardino, Cal.:* G. F. SGITCOVICH appointed assistant superintendent locomotive shops.

Southern.—*Knoxville, Tenn.:* WALTER W. SIMPSON, JR., appointed superintendent of motive power, succeeding LELAND C. SHULTS, retired. Mr. Simpson formerly manager, Coster Shop. HARRY J. GOLIGHTLY appointed road foreman of engines. *Spartanburg, S. C.:* CHARLES R. SMITH appointed general foreman car department, Hayne Shop. Formerly process engineer, motor shop, at Atlanta, Ga. HARVEY L. UNDERWOOD, JR., appointed production and material control engineer, Hayne Shop. *New Orleans, La.:* ROBERT R. WINTERS appointed road foreman of engines.

OBITUARY

Charles E. Horsley, 79, retired master mechanic Illinois Central, died January 5 at Mattoon, Ill.

Supply Trade Notes

ARCAIR CO.—*Jerry McEvilly* appointed field representative in the Chicago area. Headquarters, Milwaukee, Wis.

■

PANGBORN CORP.—*William E. Brandt* appointed division manager of the newly established Pangborn Vibratory Finishing Division at Hagerstown, Md.

■

ELECTRO-MOTIVE DIVISION, GENERAL MOTORS.—*Harry E. Schneider,* manager of Plant Two at Chicago, appointed superintendent of the EMD engine division at LaGrange, Ill., succeeding *Arthur A. Montes,* who has been appointed general superintendent for Plant 2. *John L. Wagner,* assistant superintendent of the locomotive division in charge of locomotive rebuild, appointed superintendent of a newly created rebuild manufacturing department at LaGrange. *Verne L. Brandes,* assistant superintendent of the locomotive division, appointed superintendent of the locomotive division, succeeding *William A. Schweinberg,* deceased. *J. I. Bocinsky* appointed manager of the North Salt Lake, Utah, branch, succeeding *J. S. Chisholm,* deceased.

■

BUDD CO. — *Dr. Marshall G. Holloway* elected a vice-president at Philadelphia, assuming direction of all company research programs. Mr. Holloway formerly president, Nuclear Products — Erco Division, ACF Industries, Inc., Washington, D.C.

■

CANADIAN TIMKEN, DIVISION OF THE TIMKEN ROLLER BEARING CO. — Timken manufacturing operations in Canada, located at St. Thomas, Ont., have been renamed Canadian Timken, Division of the Timken Roller Bearing Co. *T. W. Clift* is general manager of the Canadian division.

■

SHERWIN-WILLIAMS CO. — *Robert H. Hill* appointed director of sales, with headquarters in Midland Building, Cleveland.

■

NATIONAL MALLEABLE & STEEL CASTINGS CO. — *W. H. Moriarty,* first vice-president, elected president of the Steel Founders' Society of America.

MONTREAL LOCOMOTIVE WORKS.—*William F. Lewis,* vice-president, appointed a director and executive vice-president. Mr. Lewis had been vice-president of marketing of American Locomotive Company before joining Montreal Locomotive Works last fall. Had previously been vice-president of Alco western regional sales.

■

COOPER-BESSEMER CORP. — *Grant C. Woodard,* general sales manager, elected vice-president of marketing.

■

SOUTHERN ELECTRIC, AJAX-CONSOLIDATED DIV.—*F. A. Delano* appointed southeastern representative, succeeding *W. E. Corr,* retired.

OBITUARY

J. S. CHISHOLM, manager of Salt Lake City, Utah, factory branch of Electro-Motive Division of General Motors, died January 19.

■

THOMAS P. IRVING, 76, until 1949 engineer car construction, Advisory Mechanical Committee, Erie, Chesapeake & Ohio, Pere Marquette and Nickel Plate, and since that time vice-president in charge of sales of the Industrial Supply Co., Cleveland, died recently.

■

WILLIAM A. SCHWEINBERG, 57, superintendent of the locomotive division, Electro-Motive Division of General Motors, died January 12 at his home in La Grange Park, Ill.

Letters

Electric Fuel Cut-Off

TO THE EDITOR:

In the September issue there is a letter apparently intended to amplify an article in an earlier issue on an electrical emergency shut-down system installed on a Southern Pacific dual fuel unit. [SP Adopts Electric Fuel Cut-off System, RL&C, July 1959, p 42.] Since I did not see the article, I don't know what make of unit this shut-down system was applied on. [GP-9's.—Editor.]

Since all but one of the dual fuel units that I have seen are EMD's, I fail to understand how the engine can be stopped by de-energizing solenoids in the governor as EMD's idle with all speed control solenoids de-energized and the "D" solenoid is energized to down the engine.

I did see a system of emergency shut-down applied to two EMD "B" units in which the ability of the fuel pump to act as a valve was used to shut off the fuel. A valve was applied on the outside to the governor to the port of the oil pressure failure plunger. When this valve was opened by pulling the standard emergency shut-down wires, a micro-switch mounted on the valve was also opened, stopping the fuel pump. The opening of the valve releases the oil pressure in the speed setting servo of the governor, shutting the engine down instantly.

The advantages of this system are that the engine and fuel pump stop instantly. Tripping the emergency fuel cutoff valve does not always stop the engine, as the fuel pump continues to run. In many cases, it pulls enough fuel through the valve to keep the engine running at idle speed. Stopping an engine by starving it for fuel can result in stuck injector pump plungers.

Name Withheld.

TO THE EDITOR:

The writer of the [above] letter is correct when he calls attention to the fact that the de-energizing of the governor solenoids does not shut the engine down. The shutdown system actually energizes the "D" solenoid to shut the engine down, and this is shown on the wiring diagram in the July issue of Railway Locomotives and Cars.

The system as described utilizes the fuel pump as a safety cut-off valve, and the fuel pump does provide a very effective cut-off valve due to its very close tolerances. The energizing of the "D" valve is an additional feature which was incorporated to shut the engine down. The design of the system insures that the fuel pump is shut down if there is any interruption of the electrical circuit, making it a fail-safe device. The energizing of the "D" valve which shuts the engine down immediately is merely an added feature, but is not an absolute requirement.

Max Ephraim, Jr.
Assistant chief engineer, Electro-Motive Division

ADVERTISERS IN THIS ISSUE

Reports on Nalco Flange Lubricators Show 50 to 400% Gains in Locomotive Wheel Life

Typical Results Reported with Nalco "Moly-Stick" Dry Flange Lubricant In Railroad Service

Nalco's simple, low-cost "Moly-Stick" Dry Flange Lubricator continues to help operating men cut time, labor and equipment expense for the world's railroads. Developed to cut locomotive wheel flange wear, Nalco Flange Lubricators are showing economies in other aspects of wheel and rail wear problems. For instance:

Ore Car Wheels Wear 50% Less

Recent comparative tests on new ore cars showed greatest wear on left #4 wheels. A Nalco-Lubricator-equipped car showed from 50% to 67% less wear on left #4 wheel than any of the three unequipped cars in the tests.

Reduced Rail Wear

Locomotive installation of Nalco Flange Lubricators showed no flange wear after 70 days' operation—plus the bonus of definite indication of reduced rail wear on curves.

"Annual-to-Annual" Flange Life

This report says: "In most cases locomotives equipped with Nalco Lubricators are going from annual to annual without having to turn wheels for flanges. This was not possible prior to installation of Nalco Lubricators . . . few remaining 'wet' lubricators are being removed as locomotives receive annual inspection, and are replaced with Nalco Lubricators."

New "Moly-Sticks" Average 4000-6000 Miles

Reports indicate that new catalytically cured "Moly-Sticks" have high impact strength and excellent resiliency . . . are giving 4000 to 6000 miles of service. In switching service this long wear life means replacement is normally needed only at monthly inspections.

Nalco Flange Lubricator puts the lubricant exactly where it's needed . . . nowhere else! Stick replacement is extremely simple: Guide shoe retracts, swings out for insertion of "Moly-Sticks", then swings back into position. No nuts or bolts to loosen . . . no tools needed for this quick and easy operation.

Flange Life Upped 400%

"Locomotive has made 9435 miles since Nalco Lubricators were installed. Normal flange life is 7000 to 8000 miles. At the present rate of wear (with Nalco Lubricators) we are going to show better than a 400% improvement."

Installing Nalco Lubricators

Complete Nalco Flange Lubricator protection can usually be installed on a diesel locomotive (8 lubricators) in one man-day or less. Inspection of units and replacement of "Moly-Sticks" is a quick and easy operation.

For complete information about this more effective, more trouble-free method of flange lubrication, call your Nalco Representative today, or write Nalco for Bulletins 571 and 591.

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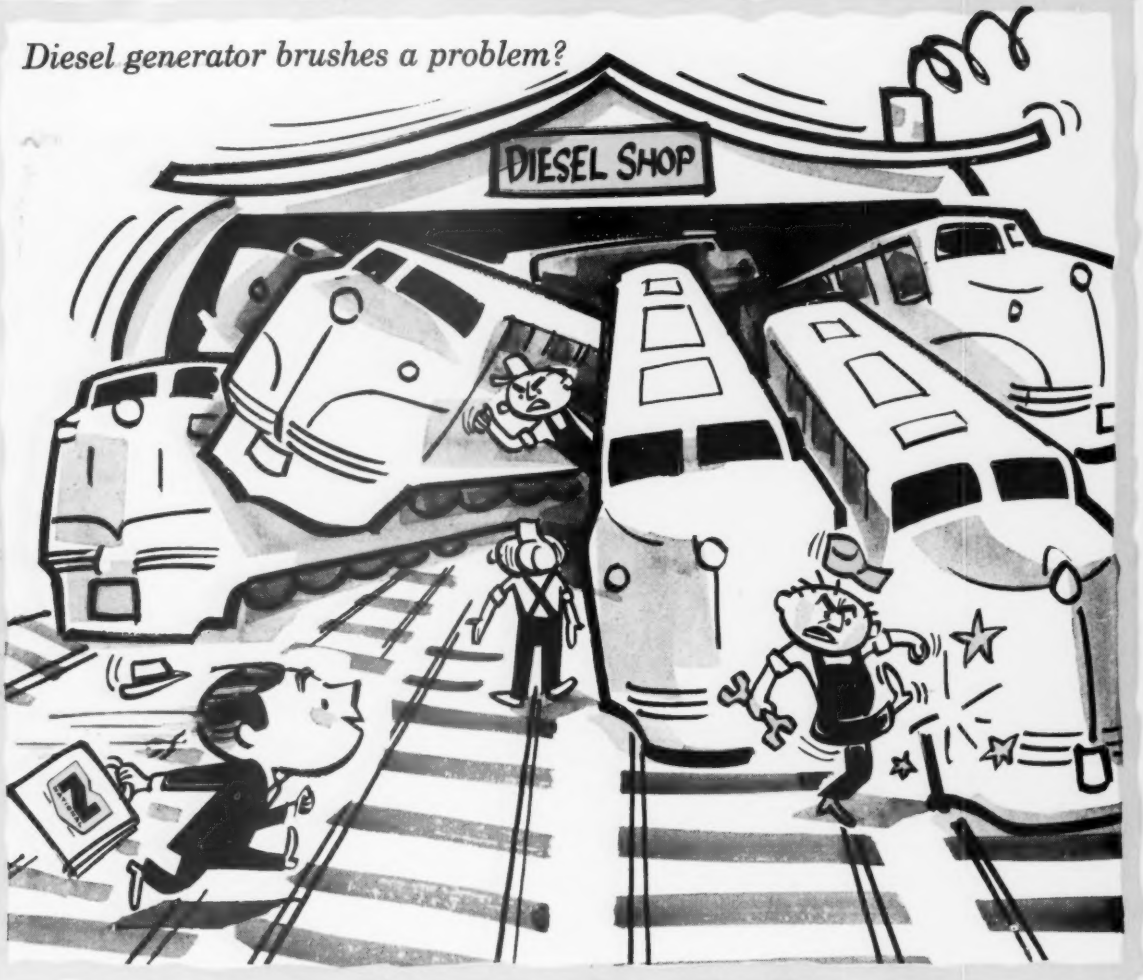
Diesel generator brushes a problem?



Your NATIONAL brush man helped this road stop excessive maintenance!

JOHN PEDLAR

PROBLEM: Serious copper dragging and flashovers.

RECOMMENDATION: "National" brush grade DE-2.

RESULTS: This road now considers its generator brush operation completely satisfactory.

Contact your "National" Brush Man